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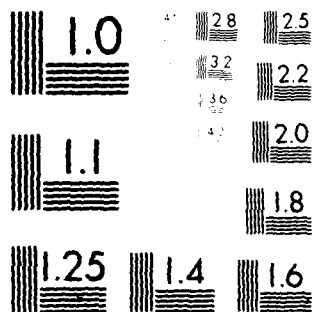
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OHIO RIVER BASIN

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PENNSYLVANIA

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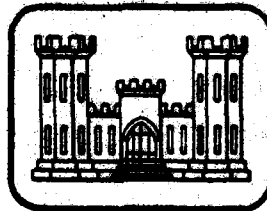
SIEGEL MARSH DAM

NDI No. PA 00015
PennDER No. 25-41

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PHASE I INSPECTION REPORT NATIONAL DAM INSPECTION PROGRAM

DACW31-80-C-0025



prepared for

DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

prepared by

MICHAEL BAKER, JR., INC.

Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

July 1980

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OHIO RIVER BASIN

SIEGEL MARSH DAM
ERIE COUNTY, COMMONWEALTH OF PENNSYLVANIA
NDI No. PA 00015
PennDER No. 25-14

⑥ PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Siegel Marsh Dam, NDI number PA-00015,
PennDER Number 25-14, Ohio River Basin, East Branch
Licking Creek, Erie County, Pennsylvania.
Phase I Inspection Report, —

Prepared for: DEPARTMENT OF THE ARMY
Baltimore District, Corps of Engineers
Baltimore, Maryland 21203

Prepared by: MICHAEL BAKER, JR., INC.
Consulting Engineers
4301 Dutch Ridge Road
Beaver, Pennsylvania 15009

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⑩ John A. Iziubek

⑫ DAW-80-4-0025

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PREFACE

This report is prepared under guidance contained in the "Recommended Guidelines for Safety Inspection of Dams," for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The spillway design flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

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PHASE I REPORT
NATIONAL DAM INSPECTION PROGRAM

Siegel Marsh Dam, Erie County, Pennsylvania
NDI No. PA 00015, PennDER No. 25-41
East Branch of LeBoeuf Creek
Inspected 13 May 1980

ASSESSMENT OF
GENERAL CONDITIONS

Siegel Marsh Dam is owned and operated by the Pennsylvania Game Commission and is classified as a "Significant" hazard - "Intermediate" size dam. Siegel Marsh Dam was found to be in good overall condition at the time of inspection.

Hydraulic/hydrologic evaluations, performed in accordance with procedures established by the Baltimore District, Corps of Engineers, for Phase I Inspection Reports, revealed that the spillway will pass the 1/2 Probable Maximum Flood (1/2 PMF) without overtopping the dam. A spillway design flood (SDF) in the range of the 1/2 PMF to Probable Maximum Flood (PMF) is required for Siegel Marsh Dam. The 1/2 PMF was chosen as the SDF because the dam is on the low side of the "Intermediate" size category due to the low height of the embankment. The spillways are therefore considered "adequate".

The inspection revealed certain items of remedial work which should be performed immediately by the owner. Items 1 through 3 below should be completed under the guidance of a qualified licensed professional engineer experienced in the design and construction of earth dams and appurtenant structures. These items include:

- 1) Place slope protection on the upstream face to prevent scour and erosion from wave action.
- 2) Place slope protection along the left side of the right spillway discharge channel.
- 3) Fill the low areas on the top of dam adjacent to the left spillway.
- 4) Clean and seal the joints in the left spillway.
- 5) Fill and reseed the tire ruts on the right embankment.
- 6) Clear the small brush from the toe and apron junction of the left embankment and left spillway.

SIEGEL MARSH DAM

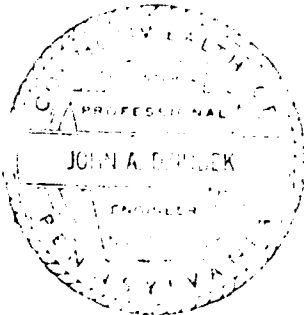
In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rainfall, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, operation, and record-keeping procedures be developed and implemented.

Submitted by:

MICHAEL BAKER, JR., INC.



John A. Dziubek
John A. Dziubek, P.E.
Engineering Manager-Geotechnical

Date: 10 July 1980

Approved by:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS

James W. Peck
JAMES W. PECK
Colonel, Corps of Engineers
District Engineer

Date: 11 August 80

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SIEGEL MARSH DAM



Overall View from the Left Abutment

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PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM
SIEGEL MARSH DAM
NDI No. PA 00015, PennDER No. 25-41

SECTION 1 - PROJECT INFORMATION

1.1 GENERAL

- a. Authority - The Dam Inspection Act, Public Law 92-367, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a program of inspection of dams throughout the United States.
- b. Purpose of Inspection - The purpose of the inspection is to determine if the dam constitutes a hazard to human life or property.

1.2 DESCRIPTION OF PROJECT

- a. Description of Dam and Appurtenances - Siegel Marsh Dam was originally constructed as a 9 foot high earth embankment with a single concrete spillway 136 feet long. At a later date, the embankment was raised 1.5 feet, the spillway was raised 3.5 feet, and an additional spillway with a length of 126 feet was added. The impoundment is situated in State Game Lands No. 218 and is used for wild life propagation.

The original dam was designed in March 1957 and consisted of a concrete spillway flanked by earth embankments. Construction of the dam began in August 1957 and was completed in January 1958. The earth embankment on the left side of the spillway was 340 feet long and on the right side the embankment was 250 feet long. The upstream embankment slope was 3H:1V (Horizontal to Vertical) and the downstream embankment slope was 3H:1V. Construction to raise the earth embankments 1.5 feet was completed in September 1972.

The embankment currently consists of three sections separated by two spillway structures. The right portion is 250 feet long and has 3H:1V slopes both upstream and downstream. The central portion (located between the two spillways) is approximately 100 feet long and has 3H:1V side slopes. The left portion is approximately 115 feet long and has 3H:1V side slopes.

The spillway currently consists of two trapezoidal shaped, broad-crested concrete weirs separated by an earth embankment. The total crest length of the spillways is 262 feet (perpendicular to flow). The crest width of the spillways is 2 feet (parallel to flow). Downstream from each of the spillways is a concrete apron approximately 16 feet long. Below the aprons, each spillway discharges into its own discharge channel which join together at the original stream channel approximately 100 feet downstream from the dam.

A minimum flow of at least 1.71 c.f.s. out of the reservoir is maintained by a set of stop logs on the left side of the right spillway. There are two sets of stop logs, one upstream from the other. The opening controlled by the stop logs is 6 feet wide and extends for the entire height of the spillway weir, 6.5 feet. All of the stop logs can be removed to drain the reservoir.

- b. Location - Siegel Marsh Dam is located approximately 6.5 miles southeast of the City of Erie across East Branch LeBoeuf Creek. The dam is situated immediately upstream of Route 25056 in Greene Township, Erie County, Pennsylvania. The coordinates of the dam are N 42° 03' 12" and W 79° 55' 54". The dam and reservoir can be located on the USGS 7.5 minute topographic quadrangle, Hammett, Pennsylvania.
- c. Size Classification - The height of the dam is 10 feet. The reservoir volume to the minimum top of dam, Elevation 1295.2 feet Mean Sea Level (M.S.L.), is 2860 acre-feet. Therefore, the dam is in the "Intermediate" size category.
- d. Hazard Classification - Because property damage to the Route 25056 bridge, located immediately downstream of the dam, is likely but loss of life due to failure of the dam is unlikely, the dam is classified in the "Significant" hazard category.
- e. Ownership - The dam and reservoir are owned by the Pennsylvania Game Commission, Box 1567, Harrisburg, Pennsylvania 17120.
- f. Purpose of Dam - The reservoir is used for wild life propagation and waterfowl management.
- g. Design and Construction History - The dam was originally designed in March 1957 by the Commonwealth

of Pennsylvania. The dam consisted of a trapezoidal shaped concrete weir spillway 136 feet long flanked by earth embankments, approximately 340 feet long on the left and 250 feet long on the right. A set of six foot long stop logs was included at the left end of the spillway. In April 1971, L. Robert Kimball Consulting Engineers of Ebensburg, Pennsylvania designed an addition to the existing Siegel Marsh Dam. The addition consisted of elevating the earth embankments 1.5 feet, elevating the concrete spillway 3.5 feet, and constructing an additional 126 foot long trapezoidal shaped concrete weir spillway approximately 100 feet to the left of the existing spillway. The original dam was completed in 1958. The construction of the addition to the dam was completed in September 1972. In August 1977, repairs were made to a portion of the spillway. The joints between the spillway and apron were sealed, weep holes were cleaned and repacked with gravel, and a scour hole at the joint was filled with grout under pressure. This work was completed 28 August 1977 by Schick Matts Corporation of Erie, Pennsylvania. Grouting was performed by William L. Watson Company of Kenmore, New York under subcontract to Schick Matts Corporation.

- h. Normal Operational Procedures - The pool elevation for Siegel Marsh Dam is fluctuated throughout the year to provide for proper waterfowl management. The pool level is normally maintained at the crest of the spillways, Elevation 1291.5 feet M.S.L., during the months from December through March. During April and May the pool is gradually lowered by removing stop logs to Elevation 1285.0 feet M.S.L. and is maintained at this level until September. At this time, the pool is allowed to rise again to the spillway crest by replacing the stop logs.

1.3 PERTINENT DATA

- a. Drainage Area (square miles) - 10.14
 - b. Discharge at Dam Site (c.f.s.) -
- | | |
|---|------|
| Spillway Capacity (Top of Dam
El. 1295.2 ft. M.S.L.) - | 6690 |
|---|------|

c. Elevation (feet above M.S.L.) -

Design Top of Dam -	1295.5
Minimum Top of Dam -	1295.2
Spillway Crests ¹ -	1291.5
Toe of Dam -	1285.0
Maximum Tailwater of Record -	Unknown

d. Reservoir (feet) -

Length of Maximum Pool (El. 1295.2 ft. M.S.L.) -	11,200
Length of Normal Pool (El. 1291.5 ft. M.S.L.) -	9500

e. Storage (acre-feet) -

Top of Dam (El. 1295.2 ft. M.S.L.) -	2860
Normal Pool (El. 1291.5 ft. M.S.L.) -	2200

f. Reservoir Surface (acres) -

Top of Dam (El. 1295.2 ft. M.S.L.) -	510
Normal Pool (El. 1291.5 ft. M.S.L.) -	400

g. Dam -

Type -	Earthfill
Length -	590
Maximum Height (feet) - Design -	10
Field -	10
Top Width (feet) -	Varies from 10 to 13 feet
Side Slopes - Upstream ² -	3H:1V
Downstream -	3H:1V
Zoning -	The original earth embankment is comprised of two classes of material. The central core is impervious, structurally sound, and free from vegetative matter and stone larger than six inches in diameter. The central core, the middle one-third of the embankment, is 10 feet wide at El. 1294.0 ft. M.S.L. and has 1H:1V side slopes to original ground. The material placed upstream and downstream of the central core is structurally sound but not impervious. It may contain gravel and stones up to six inches in diameter but no vegetative material.

¹Both spillway crests are at the same elevation.

²Note: The upper 1.5 feet varies according to the design plans from 2H:1V to 3H:1V.

On the upstream side of the embankment this material joins the central core at El. 1294.0 ft. M.S.L. and has a 3H:1V side slope to original ground. On the downstream side of the embankment this original material joins the central core at El. 1294.0 ft. M.S.L. and has a 2H:1V side slope to original ground. When the dam was elevated 1.5 feet, the downstream slope was revised to 3H:1V by stripping and stepping the downstream slope before the additional fill was placed. The material for this new fill in the embankment consisted of a uniform mixture of material excavated from the site of the new spillway. Plate 9 shows a typical section of the embankment prior to the modifications.

Impervious Core - The central core, the middle one-third of the embankment, is 10 feet wide at El. 1294.0 ft. M.S.L. and has 1H:1V side slopes to original ground. The material for the central core is impervious, structurally sound, and free from vegetative material and stones larger than six inches in diameter.

Cut-off - A cut-off trench a minimum of 6 feet wide and 4 feet deep and comprised of the same material as the central core lies under the entire length of the embankment.

Grout Curtain -	None
Drains -	None

h. <u>Diversion and Regulating Tunnel</u> -	None
---	------

i. Spillway -

Type - Two trapezoidal shaped, broad-crested, concrete weirs

Crest Length Perpendicular to

Flow (feet) - Left Spillway -	126
-------------------------------	-----

Right Spillway -	136
------------------	-----

Total -	262
---------	-----

Crest Width (feet) -	2.0
----------------------	-----

Gates -	None
---------	------

Upstream Channel - There is an earth-lined approach channel to the left weir; no approach channel for the right weir.

Discharge Channel - Concrete apron extending 16 feet downstream from the crest of each weir

Downstream Channel - Natural streambed

- j. Regulating Outlets - A minimum flow of at least 1.71 c.f.s. out of the reservoir is maintained by a set of stop logs located on the left side of the right spillway. There are two sets of stop logs, one upstream from the other. The opening controlled by the stop logs is 6 feet wide and extends the entire height of the weir, 6.5 feet. All of the stop logs can be removed to drain the reservoir.

SECTION 2 - ENGINEERING DATA

2.1 DESIGN

The review of information for this dam included the Pennsylvania Department of Environmental Resources' (PennDER) File No. 25-41. The following information is contained in the file for this dam:

- 1) Design Drawings and Specifications for original dam dated 22 March 1957 by the Commonwealth of Pennsylvania and Design Drawings and Specifications for addition to dam dated 30 April 1971 by L. Robert Kimball, Consulting Engineers.
- 2) Application (dated 31 July 1956) to and permit (dated 2 August 1956) from the Water and Power Resources Board to construct Siegel Marsh Dam including relevant correspondence.
- 3) Application (dated 8 April 1969) to and permit (dated 8 April 1969) from the Water and Power Resources Board to Construct a change in the existing Siegel Marsh Dam including relevant correspondence.
- 4) Correspondence between the Pennsylvania Fish Commission and the Water and Power Resources Board from 5 May to 9 May 1958 concerning minor repairs to the earth embankment.
- 5) Correspondence from 25 June 1976 to 13 September 1977 concerning repairs to the spillway including inspection reports and drawings.
- 6) Miscellaneous correspondence including Water Resources Inventory Forms.
- 7) Inspection Report and Photographs of Siegel Marsh Dam dated 19 September 1967.
- 8) Photographs of Siegel Marsh Dam dated 28 June 1973.
- 9) "Engineering Report on Raising the Water Level of Siegel Marsh Dam," L. Robert Kimball and Associates, Ebensburg, Pennsylvania, 1969. Available in PennDER File.

- 10) "Siegel Marsh Dam, Soils and Foundation," L. Robert Kimball and Associates, undated.
- 11) "Quantity Estimates for the Raising of the Water Level of Siegel Marsh Dam," L. Robert Kimball and Associates, 1969.

2.2 CONSTRUCTION

Siegel Marsh Dam was originally constructed in 1958. The construction of the addition to the dam was completed 8 September 1972. Repairs to the spillway were completed 28 August 1977 by Schick Matts Corporation of Erie, Pennsylvania.

2.3 OPERATION

The operation of Siegel Marsh Dam is the responsibility of the Pennsylvania Game Commission. There are no formal written operational procedures. The reservoir level is controlled by the level of the stop log in the spillway.

2.4 EVALUATION

- a. Availability - The information reviewed is readily available from PennDER's File No. 25-41. Additional information was obtained by interviewing the owner's representative; however, this information is limited to the time period for which the personnel have been working for the owner.
- b. Adequacy - The information available is adequate for a Phase I Inspection of the dam.
- c. Validity - There is no reason at the present time to doubt the validity of the information reviewed.

SECTION 3 - VISUAL INSPECTION

3.1 FINDINGS

- a. General - The dam and its appurtenant structures were found to be in good overall condition at the time of inspection. On the day of the inspection the weather was rainy and foggy. Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list, field sketch³, top of dam profile, and typical cross-section are given in Appendix A.
- b. Dam - The following is a list of deficiencies noted during the visual inspection of the embankment.
 - 1) Erosion of the upstream face at pool level.
 - 2) Low areas on the embankment adjacent to the left spillway.
 - 3) Tire ruts and lack of vegetation on the right embankment.
 - 4) Some small brush at the downstream toe of the left embankment/left spillway junction.
- c. Appurtenant Structures - The following is a list of deficiencies noted during the visual inspection of the appurtenant structures.
 - 1) The joints at the weir/training wall junction of the left spillway appear to be partially open. It is recommended that these joints be cleaned and sealed.
 - 2) Erosion and undercutting of the embankment between the two spillway discharge channels has occurred downstream and to the left of the right spillway. At the time of inspection, this erosion was just beginning to cut into the right toe of the central embankment.
- d. Reservoir Area - The reservoir and watershed area have extremely mild slopes. Most of the area immediately surrounding the reservoir is swampland. The remaining area is forested or pastureland.

³Stationing on the field sketch prepared for this report is different than that shown on the design plans included in Appendix E. Any references made to stationing in this report refer to the stations shown on the field sketch.

Because the reservoir is drawn down yearly, carrying out a majority of the sediment accumulated during the year, sedimentation has not been a significant problem.

- e. Downstream Channel - The downstream channel is mildly sloping and relatively free from obstructions. The channel passes primarily through open fields for several miles downstream from the dam.

SECTION 4 - OPERATIONAL PROCEDURES

4.1 PROCEDURES

There are no formal written procedures in the event of impending failure of the dam. However, Pennsylvania Game Commission personnel visually inspect the dam on an average of approximately once a week. The pool is typically fluctuated according to requirements for waterfowl management by the removal or insertion of stop logs in the stop log structure of the right spillway. The dam is inspected annually by an engineer from the Harrisburg office of the Pennsylvania Game Commission.

4.2 MAINTENANCE OF DAM

The Pennsylvania Game Commission is responsible for maintenance of Siegel Marsh Dam. At the present time, the maintenance of the dam is considered good. Since there are no formal written maintenance procedures, it is recommended that formal maintenance procedures be developed and implemented.

4.3 MAINTENANCE OF OPERATING FACILITIES

The Pennsylvania Game Commission is responsible for maintenance of the operating facilities. Although there are no formal written procedures, maintenance of the operating facilities is considered adequate. It is recommended that operation and prevention maintenance schedules be developed and implemented.

4.4 DESCRIPTION OF ANY WARNING SYSTEM IN EFFECT

At the present time, there is no warning system or evacuation plan in the event of a dam failure. It is recommended that a formal warning system and evacuation plan be developed and implemented in the event of dam failure.

4.5 EVALUATION OF OPERATIONAL ADEQUACY

Maintenance and operational procedures are considered good. Since there are no formal written procedures, it is recommended that schedules and procedures be developed and implemented.

SECTION 5 - HYDRAULIC/HYDROLOGIC

5.1 EVALUATION OF FEATURES

- a. Design Data - No information concerning the hydrologic and hydraulic design of the original dam and spillway is available. The hydrologic and hydraulic calculations prepared by L. Robert Kimball (1969) for the raising of the embankment and construction of an additional spillway are available in PennDER's file on the dam. These calculations are presented in the "Engineering Report on Raising the Water Level of Siegel Marsh Dam within State Game Lands No. 218" (L. Robert Kimball, 1969). The design of the additional spillway was based on the Pennsylvania "C" curve which required a total spillway capacity of 7600 c.f.s. The final spillway design capacity was 7621 c.f.s. at Elevation 1295.5 feet M.S.L. Also included in this report are flood routings for the 100-year flood and 1/3 Probable Maximum Flood (1/3 PMF). A summary of the results of these routings is presented in Appendix D.
- b. Experience Data - There are no records of major floods in this watershed. The maximum reported depth of water over the spillway crest is one foot. This corresponds to a discharge of approximately 800 c.f.s.
- c. Visual Observations - The crest of the embankment adjacent to the left training wall of the right spillway is 0.3 foot lower than the design top of dam, Elevation 1295.5 feet M.S.L. There is also a low area at Station 7+50 on the top of dam profile (Appendix A) which is 0.2 foot lower than the design top of dam elevation. These areas should be filled in to Elevation 1295.5 feet M.S.L. to prevent concentration of surface run-off at these points.
- d. Overtopping Potential - Siegel Marsh Dam is classified as a "Significant" hazard - "Intermediate" size dam requiring evaluation for a spillway design flood (SDF) in the range of the 1/2 Probable Maximum Flood (1/2 PMF) to the Probable Maximum Flood (PMF). Because the dam is on the low end of the "Intermediate" size category due to the low height of the embankment, the 1/2 PMF was selected as the SDF.

Using the U.S. Army Corps of Engineers Flood Hydrograph Package, HEC-1 DB and Snyder's unit

hydrograph parameters obtained from a regionalized analysis conducted by the Baltimore District of the Corps of Engineers, it was determined that the peak inflow to the reservoir during the 1/2 PMF is 6420 c.f.s. The total capacity of the spillway structures is 6690 c.f.s., assuming a minimum top of dam Elevation 1295.2 feet M.S.L. Because the capacity of the spillways is greater than the maximum inflow to the reservoir during the SDF, the dam and spillways will safely pass the SDF without overtopping the dam.

- e. Spillway Adequacy - As described in the above analysis, the existing spillway structures can safely pass the required SDF without overtopping the dam. The spillways are therefore considered to be "adequate".

SECTION 6 - STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

- a. Visual Observations - No structural inadequacies were noted during the visual inspection of the dam.
- b. Design and Construction Data - Calculations of embankment slope and foundation stability were not available for review. Because of the low height of the dam, its total width and moderate slopes, and because no signs of distress or seepage was observed; no further stability assessment is deemed necessary for this Phase I Inspection Report.
- c. Operating Records - Nothing in the operational information indicates concern relative to the structural stability of the dam. The pool is typically fluctuated according to requirements for waterfowl management and no instability of the upstream slope was noted.
- d. Post-Construction Changes - The post-construction changes noted in Section 1 and 2 do not adversely affect the stability of the dam.
- e. Seismic Stability - The dam is located in Zone 2 on the "Seismic Zone Map of the Contiguous United States," Figure 1, page D-30, "Recommended Guidelines for Safety Inspection of Dams." This is a zone of moderate seismic activity. Experience shows that this zone is considered to present no hazard from earthquakes provided static stability conditions are satisfied and conventional safety margins exist. As indicated in paragraph 6.1.b., Siegel Marsh Dam could be shown to meet the stability requirements, and, therefore, further consideration of the seismic stability is not warranted.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 DAM ASSESSMENT

- a. Safety - Siegel Marsh Dam was found to be in good overall condition at the time of inspection. Siegel Marsh Dam is a "Significant" hazard - "Intermediate" size dam requiring a spillway capacity in the range of the 1/2 PMF to PMF. The 1/2 PMF was chosen as the SDF because the dam is on the low side of the "Intermediate" size category due to the low height of the embankment. As presented in Section 5, the spillways and reservoir are adequate to pass the 1/2 PMF without overtopping the dam. Therefore, the spillways are considered "adequate".
- b. Adequacy of Information - The information available and observations and measurements made during the visual inspection are considered sufficient for this Phase I Inspection Report.
- c. Urgency - The owner should immediately initiate the action discussed in paragraph 7.2.
- d. Necessity for Additional Data/Evaluation - No further investigation is necessary.

7.2 RECOMMENDATIONS/REMEDIAL MEASURES

The inspection revealed certain items of remedial work which should be performed immediately by the owner. Items 1 through 3 below should be completed under the guidance of a licensed qualified professional engineer experienced in the design and construction of earth dams and appurtenant structures. These items include:

- 1) Place slope protection on the upstream face of the embankment to prevent scour and erosion from wave action.
- 2) Place slope protection along the left side of the right spillway discharge channel.
- 3) Fill the low areas on the top of dam adjacent to the left spillway.
- 4) Clean and seal the joints in the left spillway.
- 5) Fill and reseed the tire ruts on the right embankment.

- 6) Clear the small brush from the toe and apron junction of the left embankment and left spillway.

In addition, the following operational measures are recommended to be undertaken by the owner:

- 1) Develop a detailed emergency operation and warning system.
- 2) During periods of unusually heavy rainfall, provide around-the-clock surveillance of the dam.
- 3) When warning of a storm of major proportions is given by the National Weather Service, the owner should activate the emergency operation and warning system.

It is further recommended that formal inspection, maintenance, operation, and record-keeping procedures be developed and implemented.

APPENDIX A

VISUAL INSPECTION CHECK LIST, FIELD SKETCH,
TOP OF DAM PROFILE, AND TYPICAL CROSS-SECTION

Phase 1
Visual Inspection
Check List

Name of Dam Siegel Marsh Dam County Erie State PA Coordinates Lat. N 42°03.2'

NDI # PA 00015
PENNDER # 25-41

Long. W 79°55.9'

Date of Inspection 13 May 1980 Weather Overcast Temperature 45° F.

Pool Elevation at Time of Inspection 1288.6 ft.* M.S.L. Tailwater at Time of Inspection 1282.1 ft.* M.S.L.

*All elevations referenced to spillway crest, El. 1291.5 ft. M.S.L.

Inspection Personnel:

Michael Baker, Jr., Inc.:

James G. Ulinski
Wayne D. Lasch
Terry S. Hawk

Field Review (10 June 1980):

John A. Dziubek
James G. Ulinski

Owner's Representatives:

James G. Ulinski Recorder

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: SIEGEL MARSH DAM

NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

LEAKAGE

STRUCTURE TO
ABUTMENT/EMBANKMENT
JUNCTIONS

DRAINS

WATER PASSAGES

FOUNDATION

CONCRETE/MASONRY DAMS - Not Applicable

Name of Dam: SIEGEL MARSH DAM

NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SURFACE CRACKS
CONCRETE SURFACES

STRUCTURAL CRACKING

VERTICAL AND HORIZONTAL
ALIGNMENT

MONOLITH JOINTS

CONSTRUCTION JOINTS

EMBANKMENT

Name of Dam SIEGEL MARSH DAM
 NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

SURFACE CRACKS	None observed	
----------------	---------------	--

UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
---	---------------	--

SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	The entire upstream slope at the pool level has been partially eroded.	Slope protection should be in- stalled to deter scour and erosion.
--	---	---

EMBANKMENT

A-5

Name of Dam SIEGEL MARSH DAM

NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Low areas were observed at both junctions of the embankment and spillway training walls for the left spillway.	Fill the low areas to prevent concentration of run-off at these locations.
RIPRAP FAILURES	Riprap has been placed in the spillway discharge channels. No failures were observed.	
VEGETATION	The dam is well vegetated except for some minor erosion and tire rutting on the right embankment crest.	Fill the tire ruts and reseed.

EMBANKMENT

Name of Dam SIEGEL MARSH DAM
 NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	The junctions of the embankment and abutments were in good condition. There were several low areas along the crest of the dam at the junction of the embankment and left spillway training walls.	The low areas should be filled.
ANY NOTICEABLE SEEPAGE	None observed	
STAFF GAGE AND RECORDER	None	
DRAINS	None are present in the embankment. Both the spillway aprons have drains which appeared to be in satisfactory condition.	

44

44

A-7

OUTLET WORKS - None

Name of Dam: SIEGEL MARSH DAM

NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
-----------------------	--------------	----------------------------

CRACKING AND SPALLING OF
CONCRETE SURFACES IN
OUTLET CONDUIT

INTAKE STRUCTURE

OUTLET STRUCTURE

OUTLET CHANNEL

EMERGENCY GATE

UNGATED LEFT SPILLWAY

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR		The spillway weir is a concrete, trapezoidal, broad-crested weir with its crest slightly inclined downstream. The concrete was in good condition. There is some leakage and cracking around the slab joints in the weir and apron.	The joints should be cleaned and sealed.
APPROACH CHANNEL		There is an earth-lined approach channel to the weir. No obstructions or other problems were observed.	
DISCHARGE CHANNEL		The spillway discharge channel is ripped for approximately 15 ft. downstream. There is vegetation (small trees, brush, grass) in the channel but this is not a serious restriction to flow.	
BRIDGE AND PIERS		None	

UNGATED RIGHT SPILLWAY

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE WEIR		The weir is a concrete trapezoidal, broad-crested weir with its crest slightly inclined downstream. The concrete surfaces and joints were in good condition.	
APPROACH CHANNEL	None		
DISCHARGE CHANNEL		The discharge channel is ripped for approximately 10 ft. downstream. No obstructions or other problems were observed.	
BRIDGE AND PIERS	None		
STOP LOGS		The stop logs were in good condition. They are removed yearly and deteriorated stop logs are replaced.	

64

A-10

INSTRUMENTATION - None

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

<u>VISUAL EXAMINATION</u>	<u>OBSERVATIONS</u>	<u>REMARKS OR RECOMMENDATIONS</u>
MONUMENTATION/SURVEYS		
OBSERVATION WELLS		
WEIRS		
PIEZOMETERS		
OTHER		

RESERVOIR

Name of Dam: SIEGEL MARSH DAM

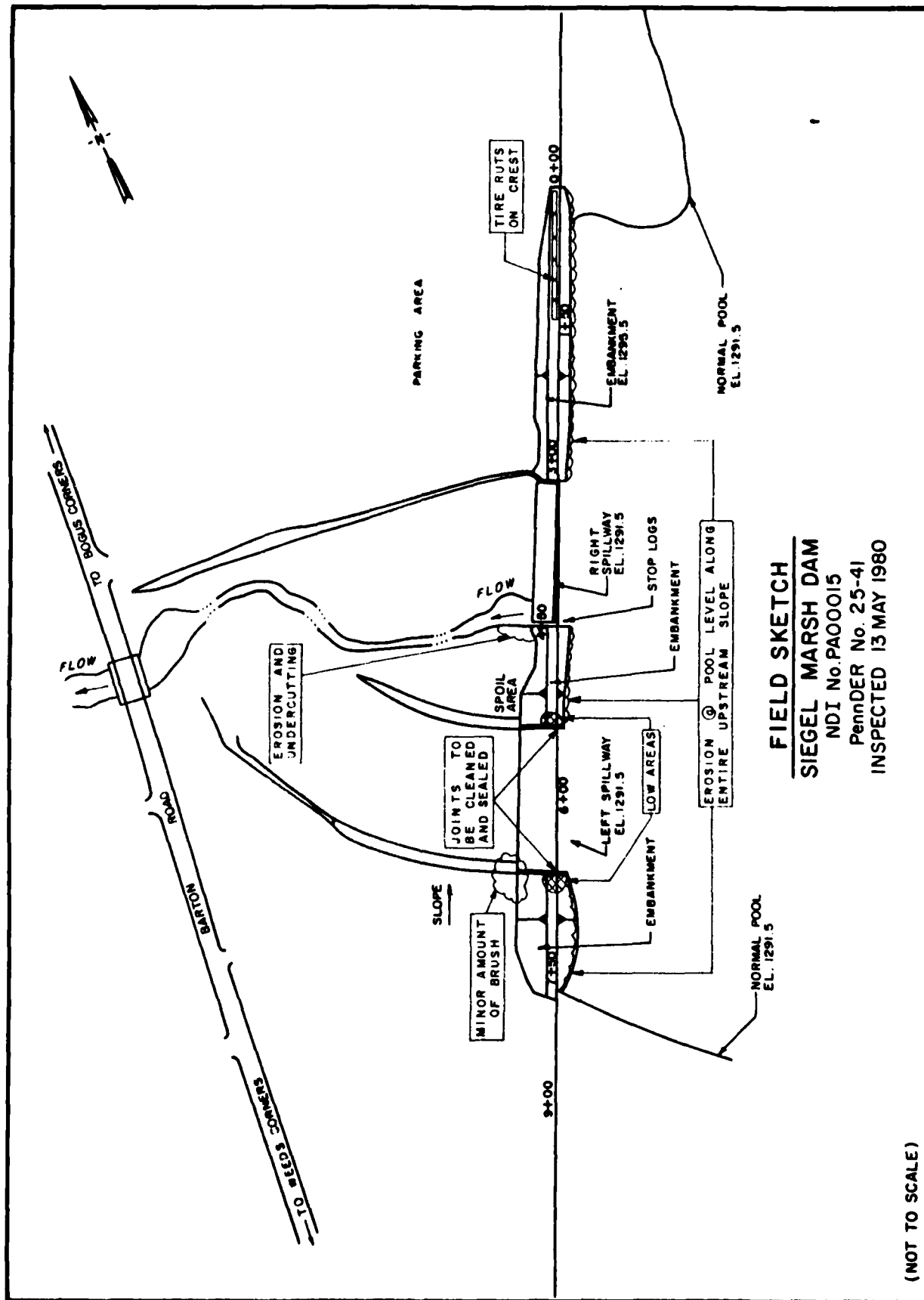
NDI # PA 00015

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The slopes of the reservoir and watershed area are extremely mild.	
SEDIMENTATION	The reservoir is drained yearly according to the game commission's wildlife management procedures. This removes much of the accumulated sediment.	

DOWNSTREAM CHANNEL

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

VISUAL EXAMINATION OF		OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	The downstream channel passes primarily through open pastures. No obstructions or other problems were observed.		
SLOPES	The slope of the channel is relatively mild.		
APPROXIMATE NO. OF HOMES AND POPULATION	There are no residential structures downstream from the dam which would be significantly affected by a dam failure.		



FIELD SKETCH
 SIEGEL MARSH DAM
 NDI No. PA00015
 PennDER No. 25-41
 INSPECTED 13 MAY 1980

(NOT TO SCALE)

MICHAEL BAKER, JR., INC.

A-14

THE BAKER ENGINEERS

30 May 1980

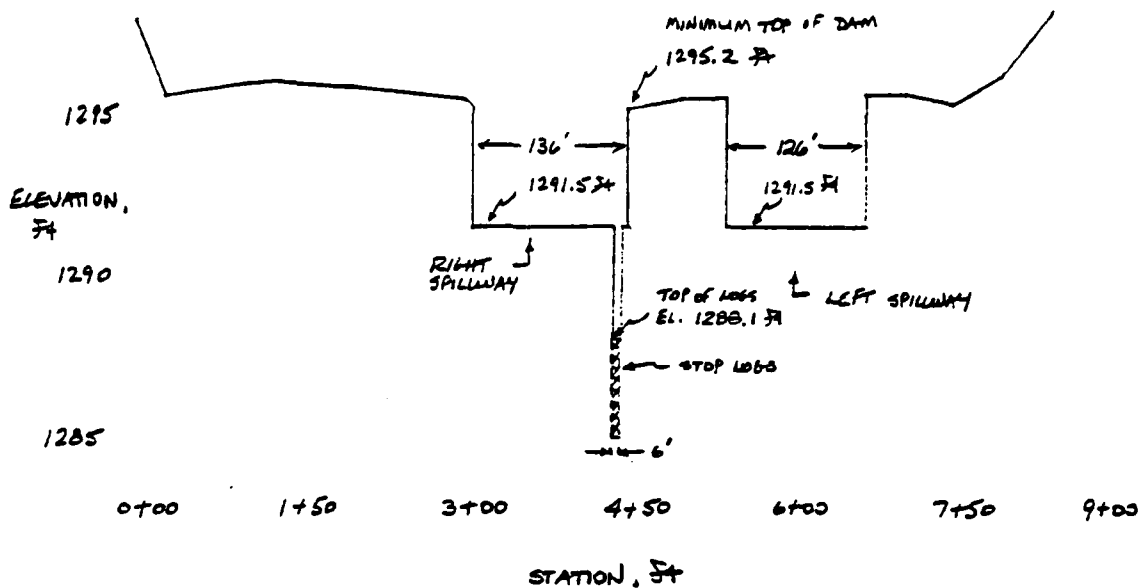
Box 280

Beaver, Pa. 15009

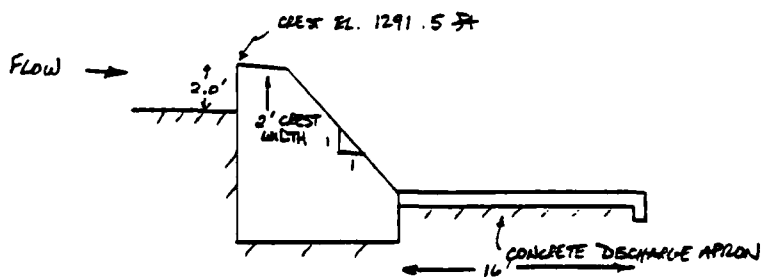
SIEGEL MARSH DAM

TOP OF DAM PROFILE

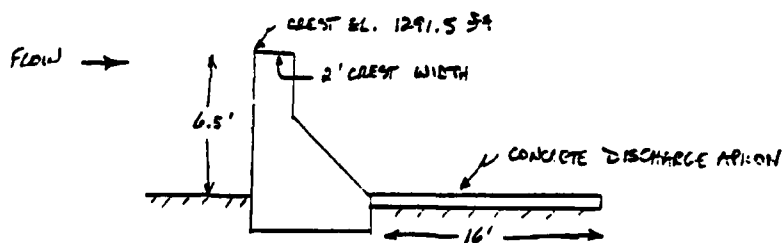
DATE OF INSPECTION - 13 May 1980



CROSS-SECTION OF LEFT SPILLWAY WEIR



CROSS-SECTION OF RIGHT SPILLWAY WEIR



MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

17 June 1980

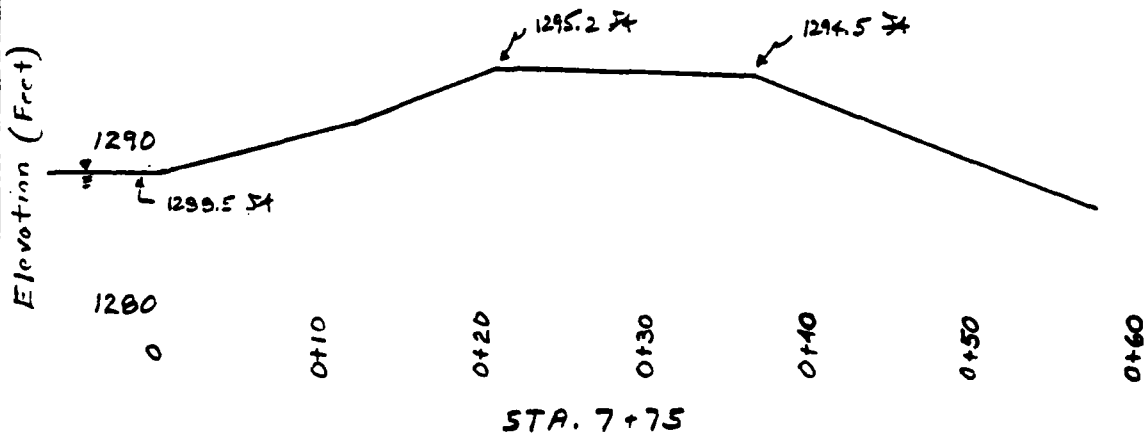
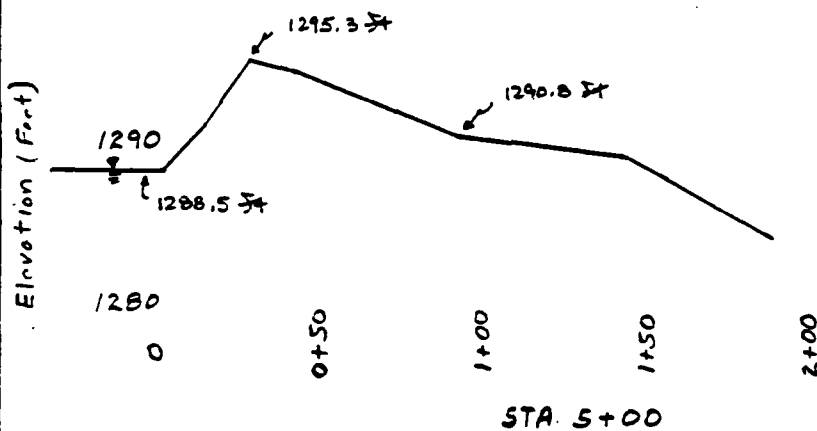
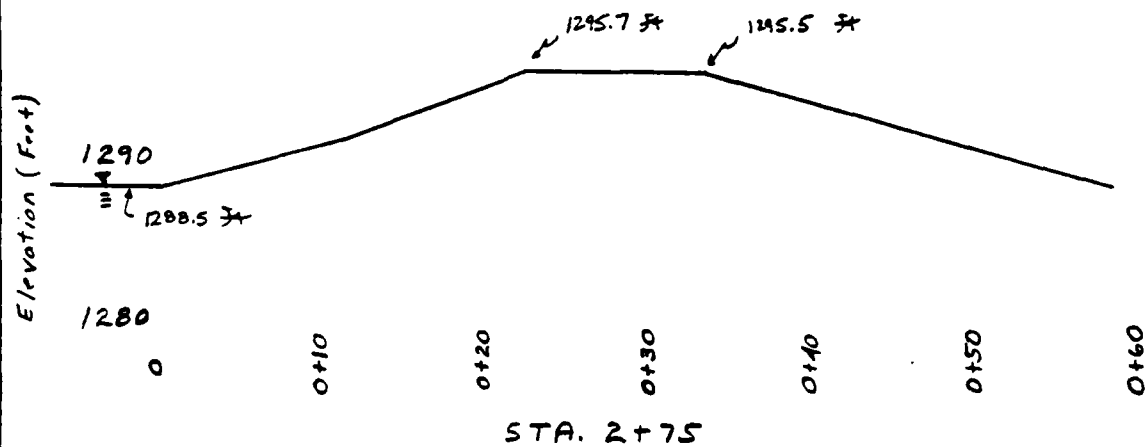
Box 280

Beaver, Pa. 15009

SIEGEL MARSH DAM

TYPICAL CROSS-SECTIONS

DATE OF INSPECTION - 13 May 1980



APPENDIX B

ENGINEERING DATA CHECK LIST

ENGINEERING DATA
CHECK LIST

DESIGN, CONSTRUCTION, OPERATION

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

ITEM	REMARKS
PLAN OF DAM	See Plate 3.
REGIONAL VICINITY MAP	A USGS 7.5 minute topographic quadrangle, Hammett, PA, was used to prepare the vicinity map which is enclosed in this report as the Location Plan (Plate 1).
CONSTRUCTION HISTORY	Siegel Marsh Dam was originally designed in March 1957 and was constructed from August 1957 to January 1958. Revisions consisting of raising the embankment 1.5 ft. and installing an additional spillway were completed in September 1972. The original design was completed by the Commonwealth of Pennsylvania and the revision design was done by L. Robert Kimball and Associates of Edensburg, PA.
TYPICAL SECTIONS OF DAM	See Plates 4 and 5.
HYDROLOGIC/HYDRAULIC DATA	Calculations prepared by L. Robert Kimball, Consulting Engineers, for the raising of the embankment and construction of an additional spillway are summarized in Section 5 and Appendix D.
OUTLETS - PLAN, DETAILS, CONSTRAINTS, and DISCHARGE RATINGS	Not Applicable
RAINFALL/RESERVOIR RECORDS	None available

Name of Dam: SIEGEL MARSH DAM

NDI # PA 00015

B-2

ITEM	REMARKS
DESIGN REPORTS	An engineering report on the raising of the water level is available in the Pennder file.
GEOLOGY REPORTS	See Pennder File No. 25-41 for geology report. The regional geology has been included in this report as Appendix F.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	A detailed summary of the hydrologic/hydraulic computations for the raising of the water level is contained in the engineer's report available in the Pennder file. Laboratory permeability testing and office calculations indicated that losses by seepage would be a negligible quantity. (See Pennder file).
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Material investigations, borings, and laboratory soil testing was performed in connection with the raising of the embankment. A report containing these items is available in the Pennder File No. 25-41.
POST-CONSTRUCTION SURVEYS OF DAM	No information available
BORROW SOURCES	The original borrow was taken from the pond area in front of the dam. The borrow for the embankment raising was from the spillway excavation.

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

B-3

ITEM	REMARKS
------	---------

MONITORING SYSTEMS

None

MODIFICATIONS

1971 - The embankment was raised 1.5 ft. The existing spillway was raised 3.5 ft. An additional spillway was constructed.
1977 - Repairs to the spillway weir and apron.

HIGH POOL RECORDS

No information available

POST-CONSTRUCTION ENGINEERING
STUDIES AND REPORTS

Detailed studies were performed in connection with raising the embankment and water level. These reports are available in the Pennder file. Engineering studies were also performed in connection with repairs performed in 1977. (See Pennder file.)

PRIOR ACCIDENTS OR FAILURE OF DAM
DESCRIPTION
REPORTS

None

MAINTENANCE
OPERATION
RECORDS

Information concerning major repairs are available through the Harrisburg Office of the Pennsylvania Game Commission. Records for routine maintenance and operation are not available.

Name of Dam: SIEGEL MARSH DAM
NDI # PA 00015

B-4

ITEM	REMARKS
SPILLWAY PLAN	See Plate 3.
- SECTIONS, and DETAILS	See Plates 6, 7, and 8.
OPERATING EQUIPMENT PLANS & DETAILS	Not Applicable

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 10.14 sq.mi. (Primarily swamp and
pasture land)

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 1291.5 ft. M.S.L.
(2200 ac.-ft.)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): 1295.2 ft. M.S.L.
(2200 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: 1295.5 ft. M.S.L.

ELEVATION TOP DAM: 1295.2 ft. M.S.L. (minimum elevation)

SPILLWAY: _____

- a. Crest Elevation 1291.5 ft. M.S.L.
- b. Type Concrete broad-crested, trapezoidal weirs (2)
- c. Width of Crest Parallel to Flow 2.0 ft.
- d. Length of Crest Perpendicular to Flow 262 ft. (total
length)
- e. Location Spillover 2 spillways in center area of embankment
- f. Number and Type of Gates None

OUTLET WORKS: Stop Logs in Right Spillway

- a. Type 2 sets of stop logs
- b. Location At left end of right spillway
- c. Bottom Invert El. 1285.0 ft. M.S.L.
- d. Emergency Drawdown Facilities These stop logs can be
removed to drawdown the
reservoir

HYDROMETEOROLOGICAL GAGES: None

- a. Type _____
- b. Location _____
- c. Records _____

MAXIMUM NON-DAMAGING DISCHARGE No records available

APPENDIX C

PHOTOGRAPH LOCATION PLAN AND PHOTOGRAPHS

DETAILED PHOTOGRAPH DESCRIPTIONS

Overall View - Overall View from the Left Abutment

Photograph Location Plan

Photo 1 - View of the Dam from the Right Downstream Area

Photo 2 - View of the Upstream Slope from the Left Abutment

Photo 3 - View of the Right Spillway from the Downstream Area

Photo 4 - View of the Right Spillway from the Right Upstream Slope

Photo 5 - View of the Stoplog Structure from the Downstream Apron

Photo 6 - View of the Stoplog Structure from the Left Side

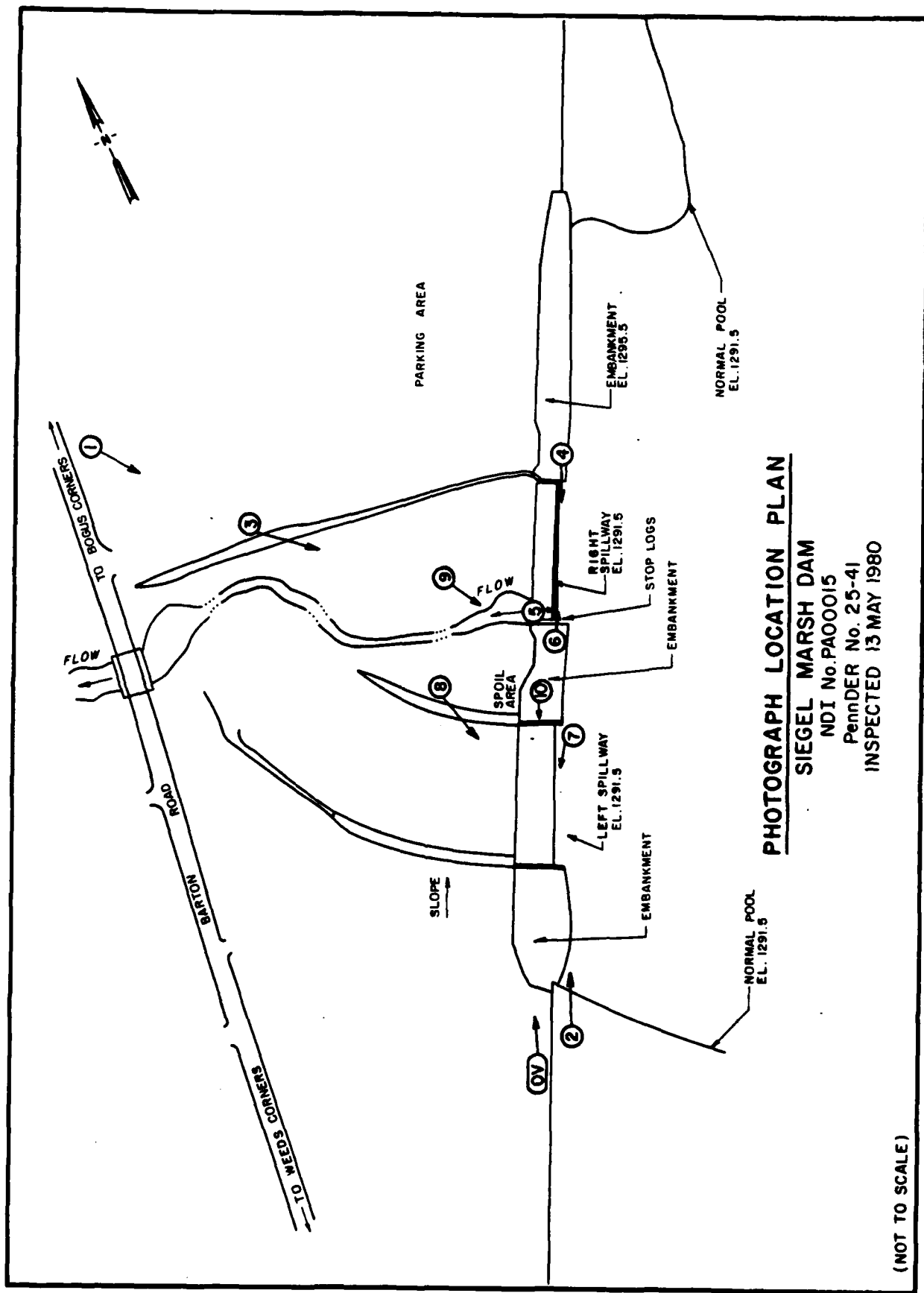
Photo 7 - View of the Left Spillway from the Right Upstream Side of the Structure

Photo 8 - View Looking Upstream at the Left Spillway from the Right Downstream Side of the Structure

Photo 9 - View Looking Upstream at the Erosion on the Left Side of the Discharge Channel of the Right Spillway

Photo 10 - Typical View of the Low Area Adjacent to Left Spillway Training Walls

Note: Photographs were taken on 13 May 1980.
Overall view of dam was taken on 10 June 1980.



SIEGEL MARSH DAM



PHOTO 1. View of the Dam from the Right Downstream Area



PHOTO 2. View of the Upstream Slope from the Left Abutment

SIEGEL MARSH DAM

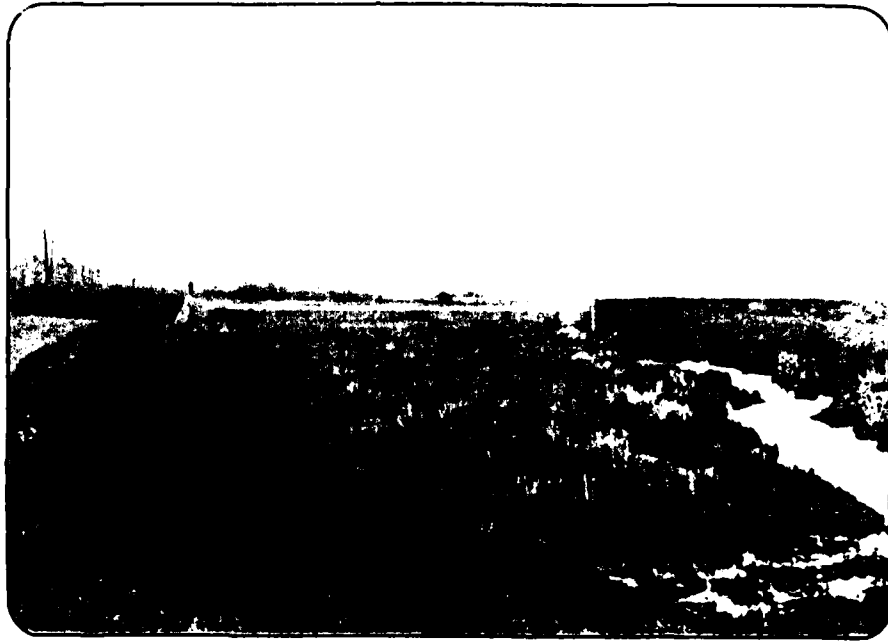


PHOTO 3. View of the Right Spillway from the Downstream Area

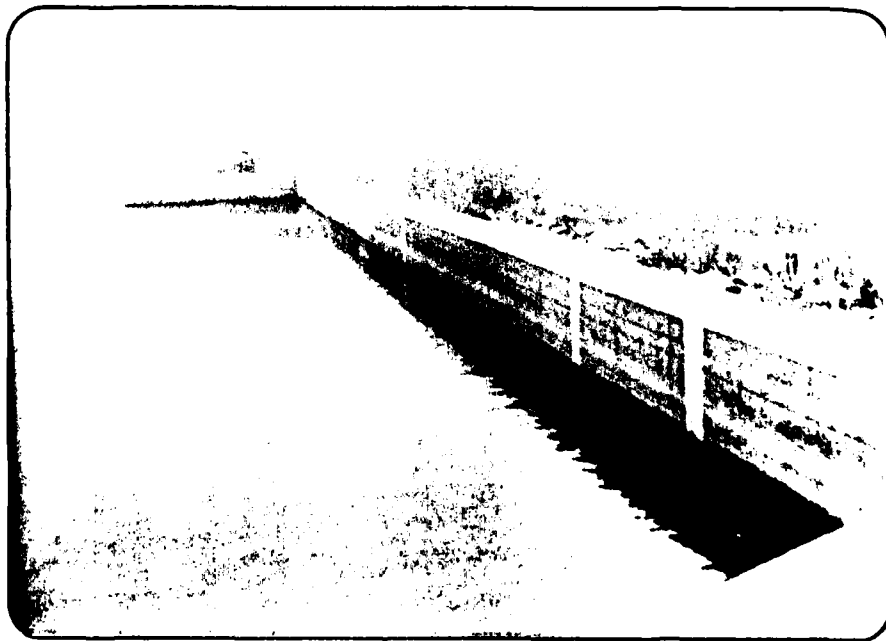


PHOTO 4. View of the Right Spillway from the Right Upstream Slope

SIEGEL MARSH DAM

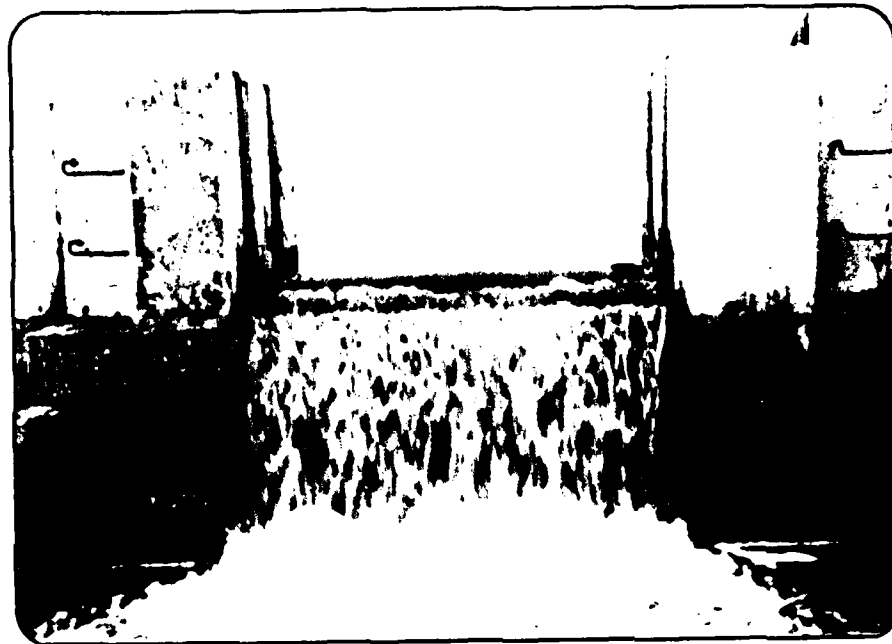


PHOTO 5. View of the Stoplog Structure from the Downstream Apron

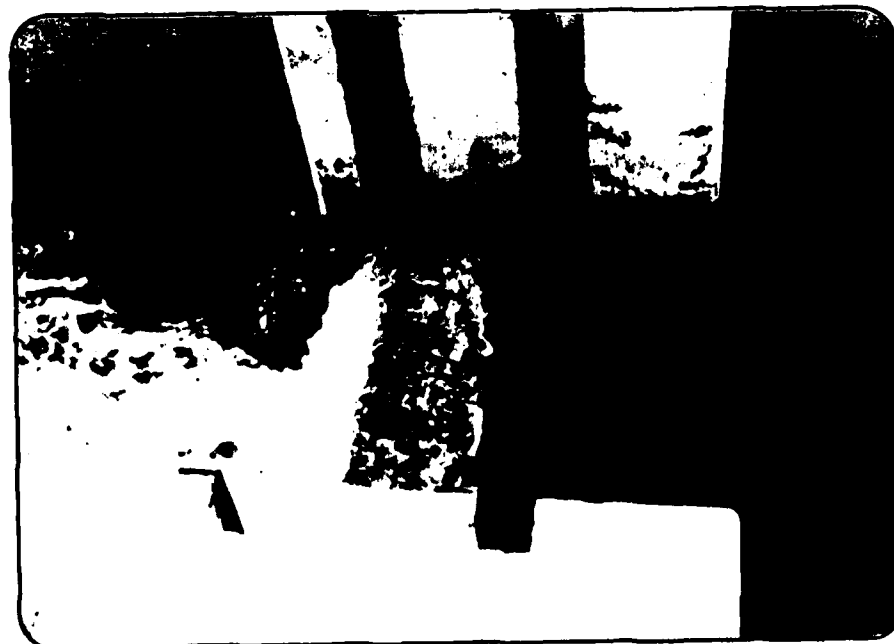


PHOTO 6. View of the Stoplog Structure from the Left Side

SIEGEL MARSH DAM

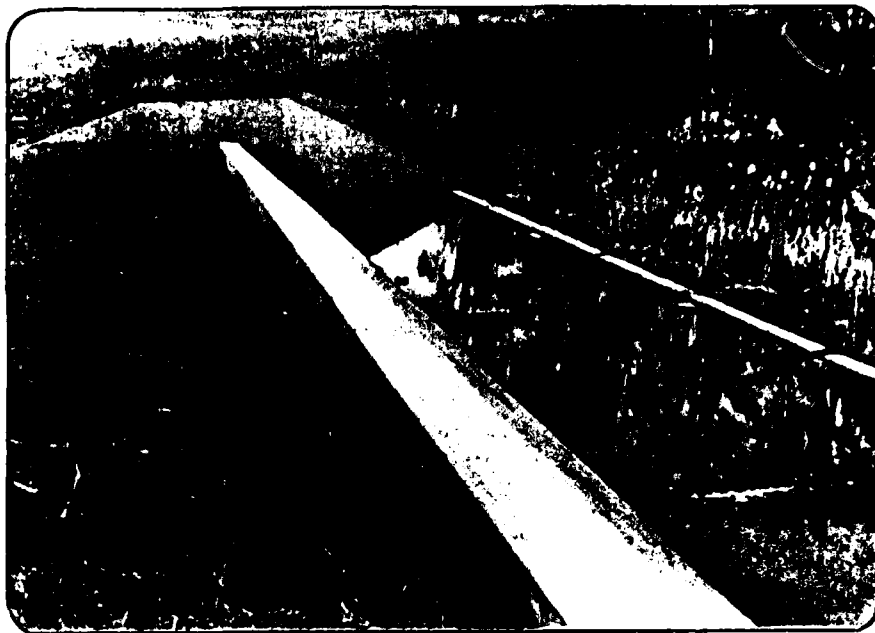


PHOTO 7. View of the Left Spillway from the Right Upstream Side of the Structure



PHOTO 8. View Looking Upstream at the Left Spillway from the Right Downstream Side of the Structure

SIEGEL MARSH DAM

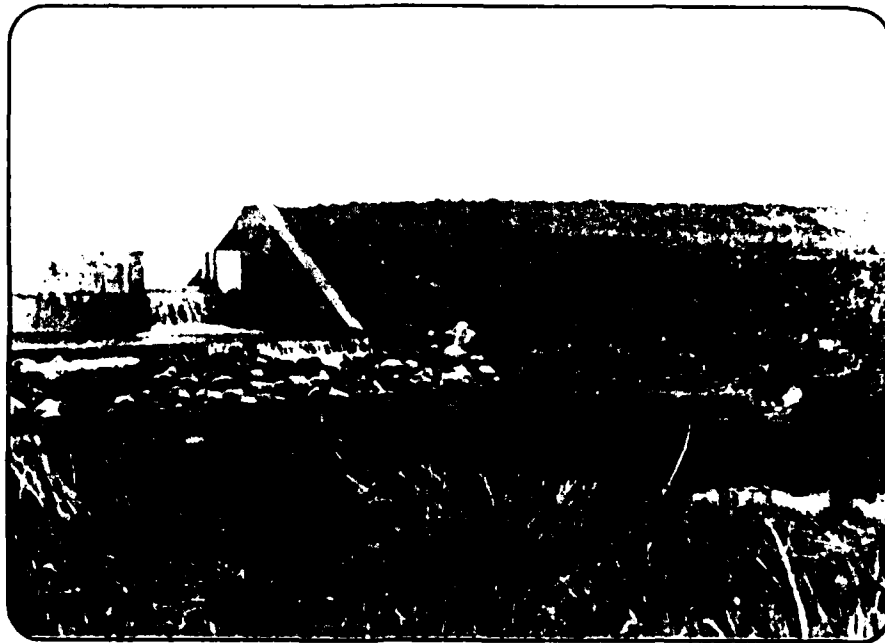


PHOTO 9. View Looking Upstream at the Erosion on the Left Side of the Discharge Channel of the Right Spillway



PHOTO 10. Typical View of the Low Area Adjacent to Left Spillway Training Walls

APPENDIX D

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

MICHAEL BAKER, JR., INC.

THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject SIEGEL MARSH DAM S.O. No. _____
APPENDIX D - HYDROLOGIC & HYDRAULIC CALCULATIONS Sheet No. _____ of _____
Drawing No. _____
Computed by _____ Checked by _____ Date _____

<u>SUBJECT</u>	<u>PAGE</u>
PREFACE	i
HYDROLOGIC AND HYDRAULIC ANALYSIS DATA BASE	1
DRAINAGE AREA MAP	2
SPILLWAY RATING CURVE	3
TOP OF DAM PROFILE	4
TYPICAL CROSS-SECTIONS	5
HEC-1 COMPUTER ANALYSIS (INFLOW TO RESERVOIR)	6

PREFACE

HYDROLOGIC AND HYDRAULIC COMPUTATIONS

The hydrologic determinations presented in this Phase I Inspection Report are based on the use of a Snyder's unit hydrograph developed by the U.S. Army Corps of Engineers. Due to the limited number of gaging stations available in this hydrologic region and the wide variations of watershed slopes, the Snyder's coefficients may yield results of limited accuracy for this watershed. As directed however, a further refinement of these coefficients is beyond the scope of this Phase I Investigation.

In addition, the conclusions presented pertain to present conditions, and the effect of future development on the hydrology has not been considered.

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: SIEGEL MARSH DAM

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.9 INCHES/24 HOURS⁽¹⁾

STATION	1	2	3	4	5
Station Description	SIEGEL MARSH DAM				
Drainage Area (square miles)	10.14				
Cumulative Drainage Area (square miles)	10.14				
Adjustment of PMF for Drainage Area (%) ⁽²⁾	Zone 2				
6 Hours	117				
12 Hours	127				
24 Hours	141				
48 Hours	151				
72 Hours	-				
Snyder Hydrograph Parameters					
Zone (3)	23				
C_p/C_t ⁽⁴⁾	0.55/3.3				
L (miles) (5)	5.27				
L_{ca} (miles) (5)	1.12				
$t_p = C_t (L \cdot L_{ca})^{0.3}$ (hours)	5.62				
Spillway Data					
Crest Length (ft)	262				
Freeboard (ft)	3.7				
Discharge Coefficient	3.59				
Exponent	1.5				

(1) Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

(2) Hydrometeorological Report 33 (Figure 2), U.S. Army, Corps of Engineers, 1956.

(3) Hydrological zone defined by Corps of Engineers, Baltimore District, for determining Snyder's Coefficients (C_p and C_t).

(4) Snyder's Coefficients.

(5) L = Length of longest water course from outlet to basin divide.

L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

QUADS:
HAMMETT

CENTROID

DRAINAGE AREA MAP
SIEGEL MARSH DAM

4000 0 4000 8000
SCALE

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject SPILLWAY RATING CURVE S.O. No. _____
INFORMATION Sheet No. 3 of 9
Drawing No. _____
Computed by LAD Checked by WDL Date _____

CURRENTLY, THERE ARE 2 SPILLWAYS FOR THE DAM. BOTH HAVE THE SAME CREST ELEVATION, 1291.5 FT MSL. CROSS-SECTIONS FOR THESE WEIRS ARE SHOWN ON SHEET 4.

L. ROBERT KIMBALL, CONSULTING ENGINEER, DESIGNED THE LEFT SPILLWAY AND THE RAISED PORTION OF THE RIGHT SPILLWAY. THEIR DESIGN PROVIDED A TOTAL SPILLWAY CAPACITY OF 7621 C.F.S. FOR A RESERVOIR SURFACE ELEVATION OF 1295.5 FT. THE MINIMUM TOP OF DAM ELEVATION MEASURED DURING THE FIELD INSPECTION ON 13 MAY 1980 WAS 1295.2 FT. THEREFORE, HEAD ON THE WEIRS CAN ONLY REACH 3.7 FT INSTEAD OF THE ALLOWED DESIGN HEAD OF 4.0 FT.

BOTH WEIRS ARE BROAD-CRESTED, TRAPEZOIDAL WEIRS WITH THEIR CRESTS INCLINED SLIGHTLY DOWNSTREAM. THE AVERAGE DISCHARGE COEFFICIENT USED FOR BOTH WEIRS (TOTAL WEIR LENGTH = 262 FT) WAS 3.59. THIS COEFFICIENT WAS VERIFIED IN ELGATER & KING'S, HANDBOOK OF HYDRAULICS AND USED TO CALCULATE THE SPILLWAY CAPACITY AT THE CURRENT MINIMUM TOP OF DAM ELEVATION, 1295.2 FT.

$$Q = CLH^{3/2}$$
$$C = 3.59$$
$$L = 262 \text{ FT}$$
$$H = 3.7 \text{ FT}$$

$$Q = 6695 \text{ C.F.S.}$$

THE MAXIMUM INFLOW TO SIEGEL MARSH DURING THE 1/2 PMF, AS CALCULATED IN THE COMPUTER ANALYSIS AT THE END OF THIS APPENDIX, IS 6420 C.F.S. BECAUSE THE MAXIMUM INFLOW TO THE EMPOUNDMENT IS LESS THAN THE CAPACITY OF THE SPILLWAY, THE DAM AND SPILLWAY CAN SAFELY PASS THE SDF WITHOUT OVERTOPPING.

MICHAEL BAKER, JR., INC.
THE BAKER ENGINEERS

Box 280
Beaver, Pa. 15009

Subject SIEGEL MARSH DAM

S.O. No. _____

TOP OF DAM PROFILE

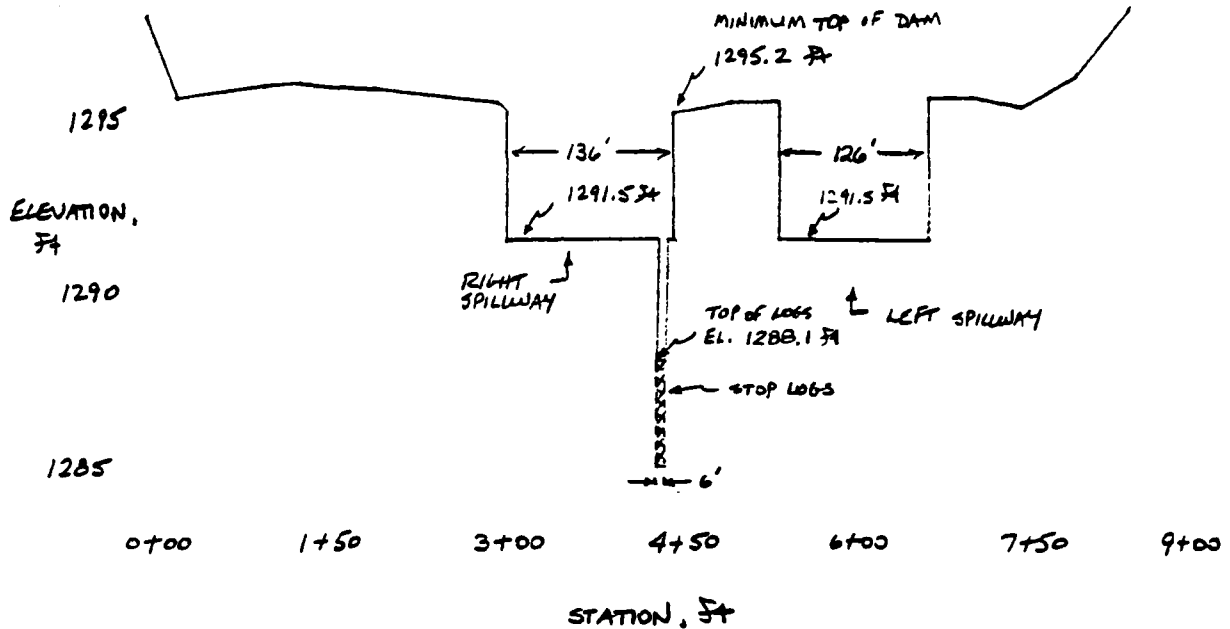
Sheet No. 4 of 9

Drawing No. _____

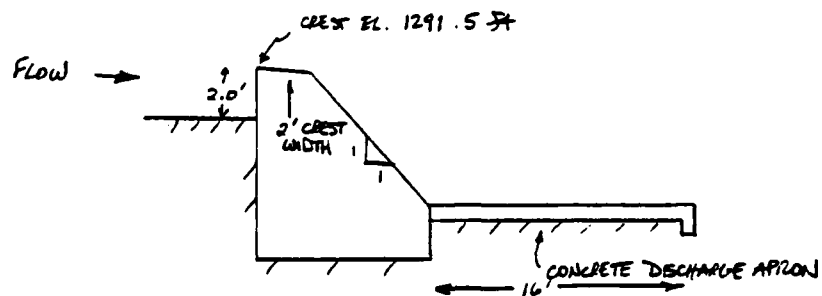
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Checked by _____

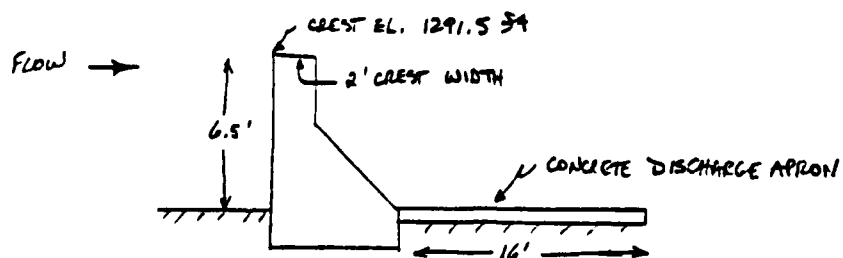
Date 5-13-80



CROSS-SECTION OF LEFT SPILLWAY WEIR



CROSS-SECTION OF RIGHT SPILLWAY WEIR:



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Subject SIEGEL MAP 4 2A12

S.O. No. _____

CROSS SECTIONS AT

Sheet No. 5 of 9

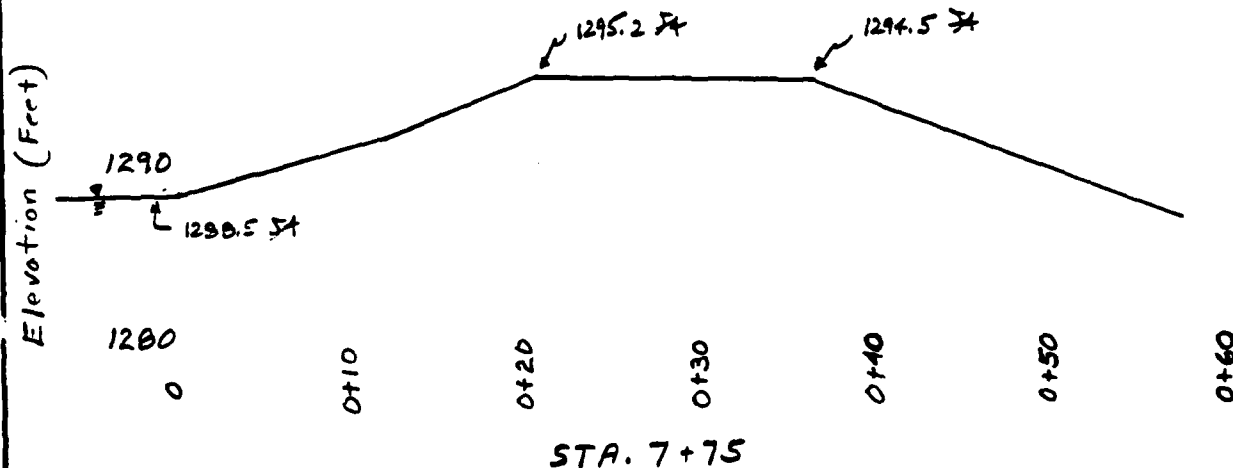
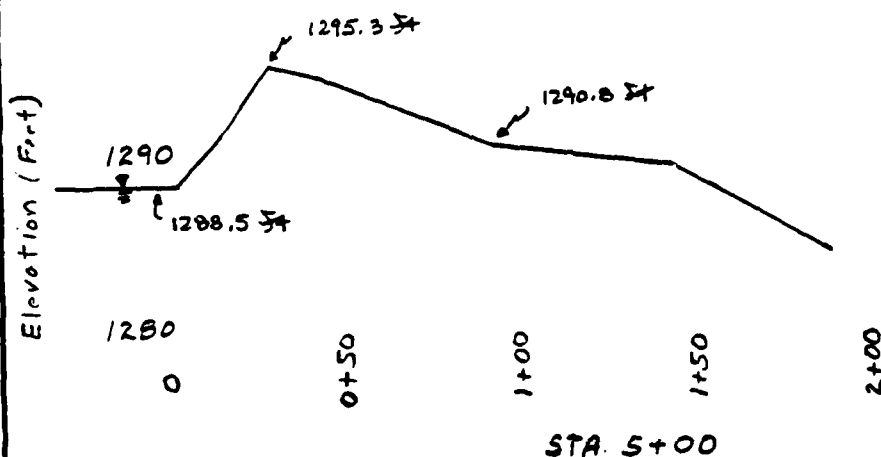
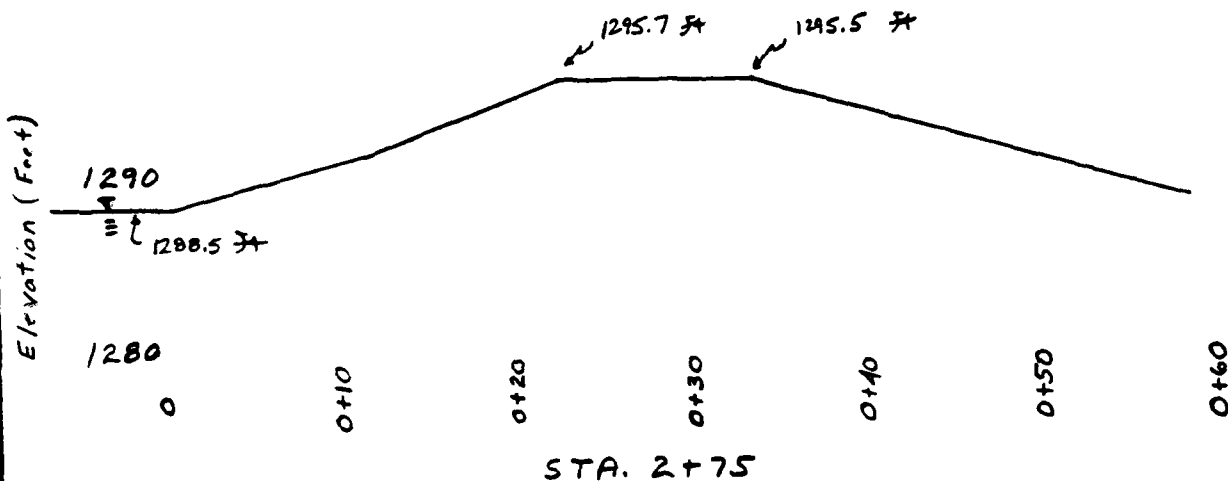
STA. 2+75 STA. 5+00, & STA. 7+75

Drawing No. _____

Computed by LAD

Checked by _____

Date 4/17/80



 FLOOD HYDROGRAPH PACKAGE (HEC-1)
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79
 M3J UPDATE 04 JUN 79

 1 A1 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
 2 A2 HYDROLOGIC AND HYDRAULIC ANALYSES OF SIGEL MARSH DAM
 3 A3 UNIT GRAPH BY SNYDERS METHOD
 4 B 100
 5 B1 5
 6 J 1
 7 J1 0.5
 8 K
 9 K1 RUNOFF HYDROGRAPH TO DAM
 10 M 1 10.14
 11 P 22.9 117 127 141 151 1.0 0.05
 12 T 5.62 0.55
 13 W -1.5 -0.05 2.0
 14 X 99
 15 K

 FLOOD HYDROGRAPH PACKAGE 1-ILL-11
 DAM SAFETY VERSION JULY 1978
 LAST MODIFICATION 26 FEB 79
 MAJ UPDATE 04 JUN 79

RUN DATE 06/06/80
 TIME 09.09

NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS
 HYDROLOGIC AND HYDRAULIC ANALYSES OF SIGEL AAKSH DAM
 UNIT GRAPH BY SNYDERS METHOD

JUR SPECIFICATION									
NQ	RHR	MAIN	IDAY	IHR	ETIM	METAG	IPLI	IPRT	INSTAN
100	1	0	0	0	0	0	0	-4	0
JUPER			5	0	0	0	0		
NWT			0	0	0	0			
LROPT			0	0	0	0			
TRACE			0	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
 NPLAN= 1 RTIU= 1 LRTIU= 1

RTIOS= 0.50

SUB-AREA RUNOFF COMPUTATION

RUNOFF HYDROGRAPH TO DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLI	JPKT	IRNML	ISTAGE	IAUJL
1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA									
IHYDG	IUHG	IAREA	SNAP	IRSDA	IRSPC	RTIU	ISUM	ISAME	LOCAL
1	1	10.14	0.0	10.14	0.0	0.0	0	0	0

PRECIP DATA									
SPEE	PMS	R6	R12	R24	R48	R72	R96		
0.0	22.90	117.00	127.00	141.00	151.00	0.0	0.0		

IRSPC COMPUTED BY THE PROGRAM IS 0.800

LCS DATA									
LROPT	STRKR	ULTRK	RTIUL	EMAIN	STRKS	RTIUK	STRKL	CRNKL	ALSKX
0	0.0	0.0	1.00	0.0	0.0	1.00	1.00	0.05	0.0

UNIT HYDROGRAPH DATA
 TP= 5.62 CP=0.25 N1= 0

RECESSION DATA
 STRJ2= -1.50 QRCN= -0.05 RTIUK= 2.00

UNIT HYDROGRAPH 39 1ND-1F-PERIOD ORDINATES, LAQ= 3.001 HUNNY CP= 3.055 VOL= 1.00									
	43.	157.	314.	475.	594.	692.	606.	222.	998.
331.	287.	245.	210.	181.	152.	133.	115.	99.	82.
73.	63.	54.	46.	40.	34.	29.	25.	22.	19.
16.	14.	12.	10.	9.	8.	6.	5.	5.	5.

90.DA HR.MN PERIOD RAIN EXCS LUSS LUD-UF-PERIOD FLUM NO.DA HR.MN PERIOD RAIN LASS LUSL LUMP V

SUA 21.00 25.24 2.94 109440.
(103.31 001.31 02.31 4751.10)

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PEAK-RATIO EQUADIAL COMPUTATIONS
 FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
 AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AKLA	PLAY	RATIO	RATIOS APPLIED TO FLOWS	
					1	0.50
HYDROGRAPH AT	1	10-14	1	6418.	← PEAK TAILOR TO RESERVOIR IS LESS	
	(26.26)	(181.74)	THAN SPILLWAY CAPACITY	

APPENDIX E

PLATES

CONTENTS

- Plate 1 - Location Plan
- Plate 2 - Watershed Map
- Plate 3 - General Plan
- Plate 4 - Profile and Cross Section
- Plate 5 - Cross Sections
- Plate 6 - Earthwork Detail at Existing Spillway
- Plate 7 - New Spillway and Sections
- Plate 8 - Addition to Existing Spillway
- Plate 9 - Plan and Details (1956 design drawing, note that this plate does not portray the current condition but was presented here to clarify the zoning of the embankment material.)

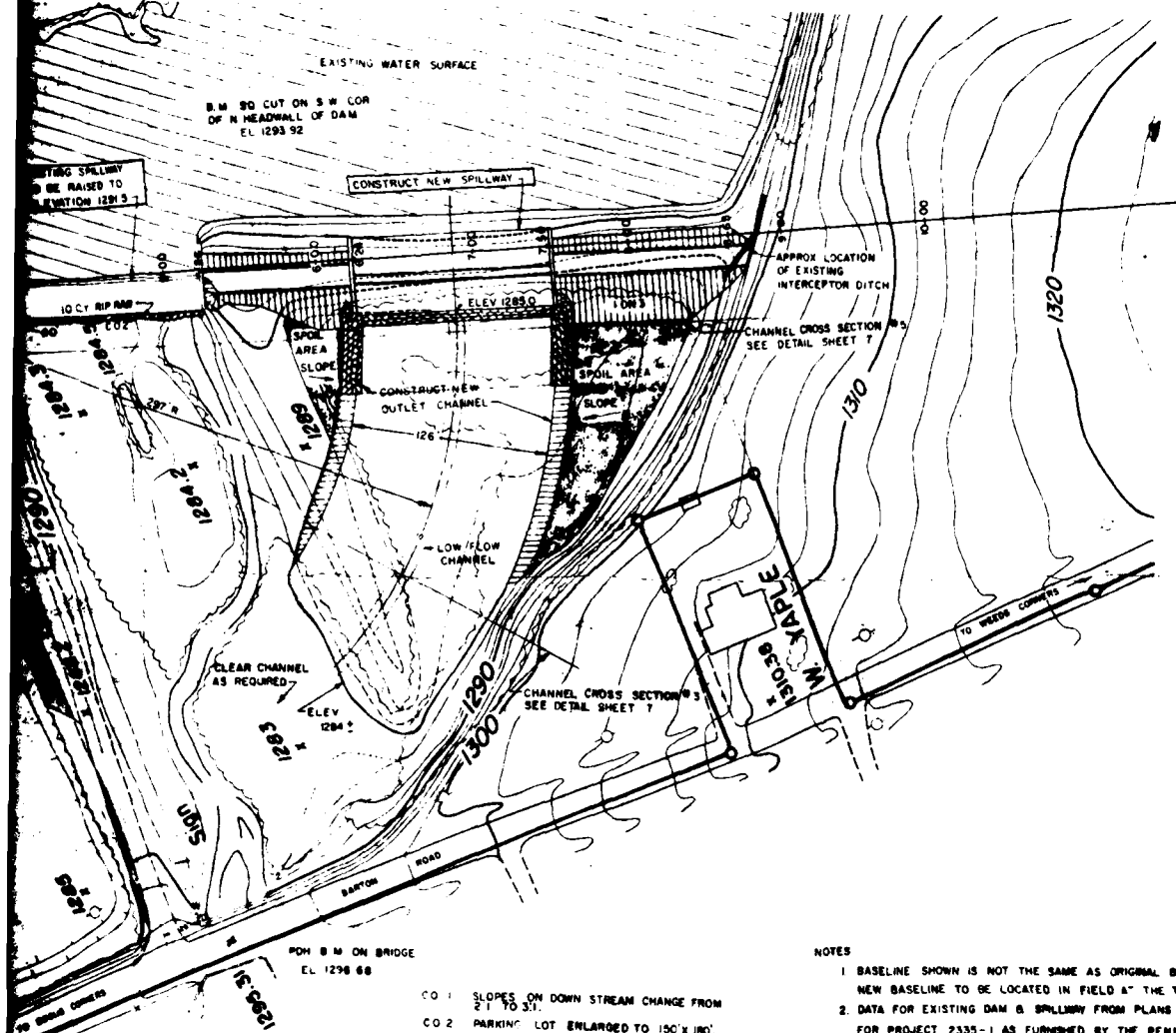
QUADS:
HAMMETT

⊕
CENTROID

DRAINAGE AREA MAP
SIEGEL MARSH DAM

4000 0 4000 8000
SCALE

PLATE 2 - WATERSHED MAP
SIEGEL MARSH DAM



PLAN
SCALE 1" = 50'

- CO 1 SLOPES ON DOWN STREAM CHANGE FROM 2:1 TO 3:1.
CO 2 PARKING LOT ENLARGED TO 150' X 180'.
10 CY RIP RAP PLACED AT EXISTING SPILLWAY.

NOTES

1. BASELINE SHOWN IS NOT THE SAME AS ORIGINAL BASELINE. NEW BASELINE TO BE LOCATED IN FIELD AT THE TIME OF CONSTRUCTION.
2. DATA FOR EXISTING DAM & SPILLWAY FROM PLANS (DATED 1957) FOR PROJECT 2335-1 AS FURNISHED BY THE PENNSYLVANIA GAME COMMISSION.
3. THIS MAP HAS BEEN PREPARED BY PHOTOGRAMMETRIC METHODS. NO FIELD SURVEY HAS BEEN PERFORMED.
4. CENTER LINE OF NEW EMBANKMENT TO BE OFF SET FROM BASE LINE AS INDICATED ON THE CROSS SECTIONS (SHEET 6).

PLATE 3

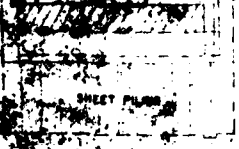
PENNSYLVANIA GAME COMMISSION RAISING THE WATER LEVEL AT DIESEL MARSH DAM ERIE COUNTY, PENNSYLVANIA			
GENERAL PLAN			
L. ROBERT KIMBALL CONSULTING ENGINEERS EDINBURGH, PENNSYLVANIA PITTSBURGH			
DRAWN BY	DATE	CHECKED BY	DATE
TRACED BY	DATE	CHECKED BY	DATE
APPROVED BY	DATE	CHECKED BY	DATE
SCALE 1" = 50'		3	

1310
1300
1290
1280
1270

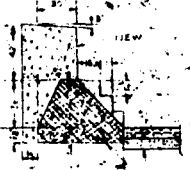
EXISTING SPILLWAY
TO BE RAISED TO
1300

EXISTING SPILLWAY
TO BE RAISED TO
1300

EXISTING



PROFILE
SCALE
1" = 10' VERT
1" = 50' HORIZ



1300
1290
1280
1270
1260

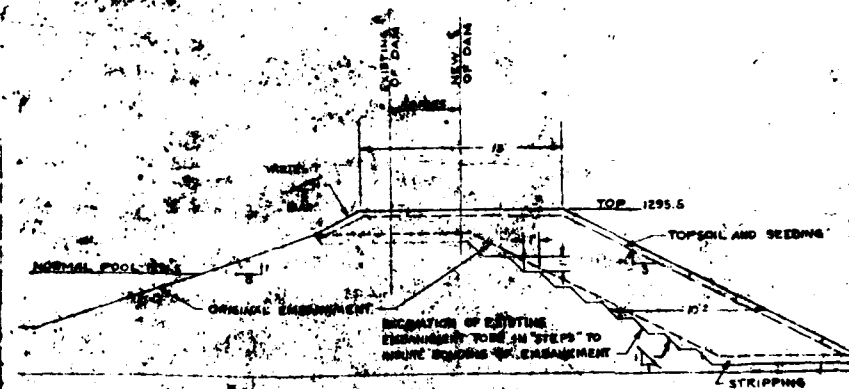
END OF SPILLWAY



NEW SPILLWAY
SCALE 1" = 5'

RAISING EXISTING SPILLWAY
SCALE 1" = 5'

1



TYPICAL CROSS SECTION
SCALE 1"=5'

1. FOR DETAILS OF IMPROVEMENT SEE SHEET A
2. FOR DETAILS OF NEW SPILLWAY SEE SHEET B
3. FOR DETAILS OF ADDITION TO EXISTING SPILLWAY SEE SHEET C

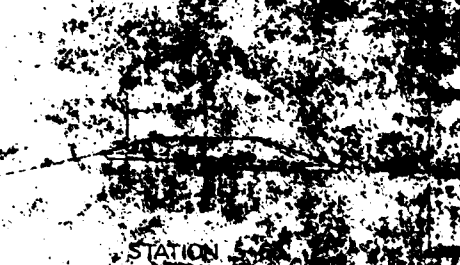
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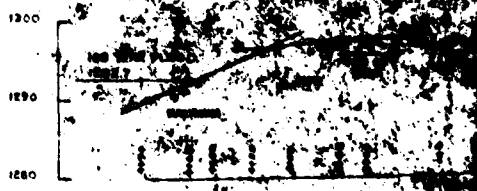
STATION: 901

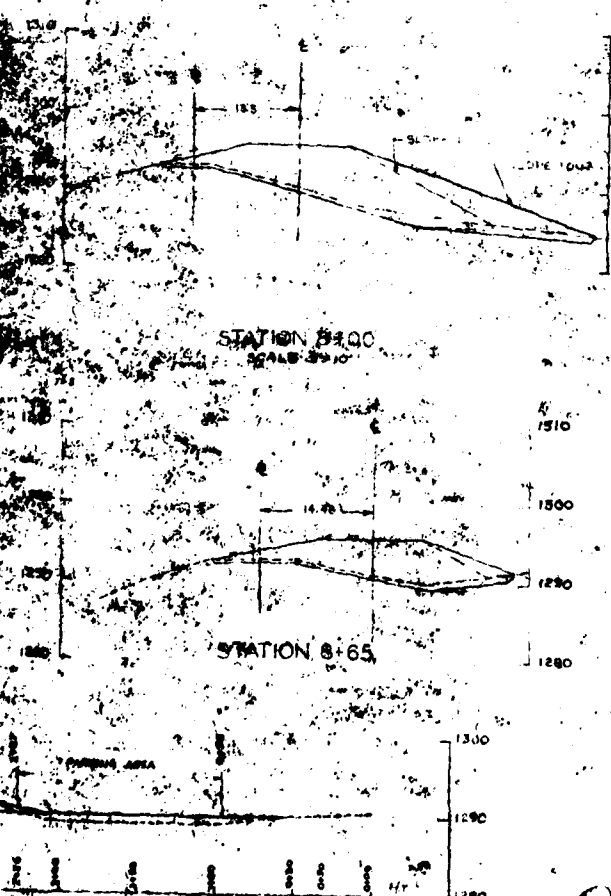
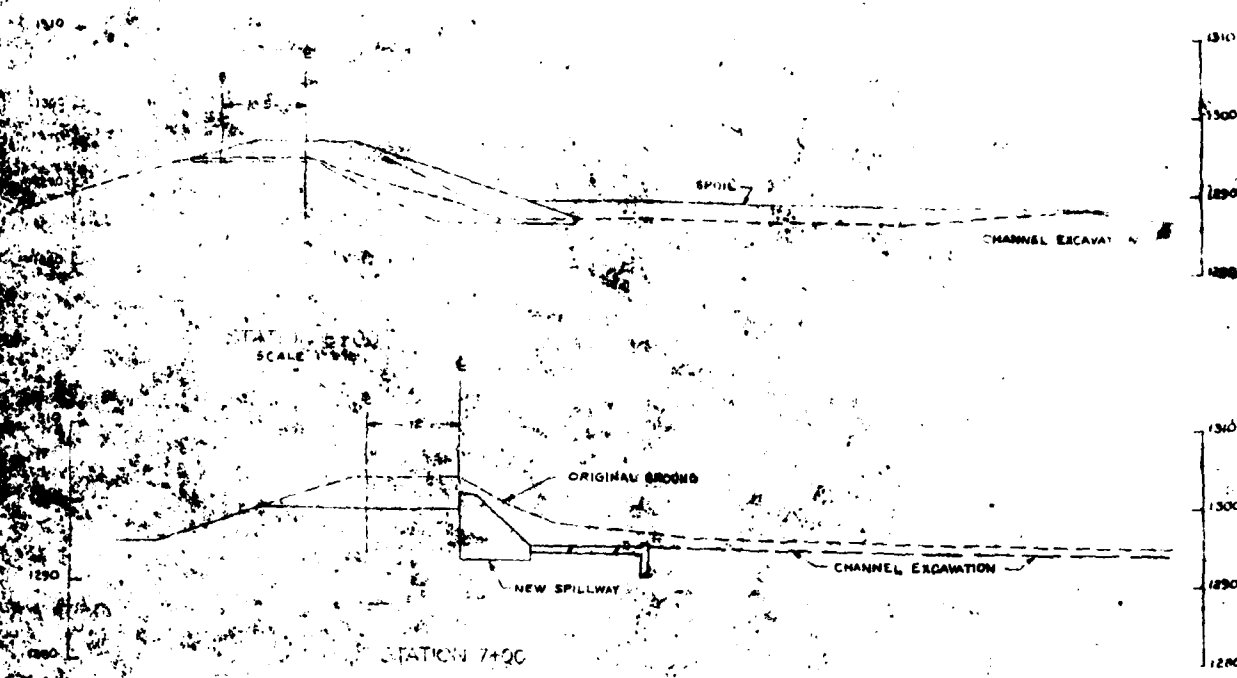


STATION
(ADDRESS) SECTION



STATION





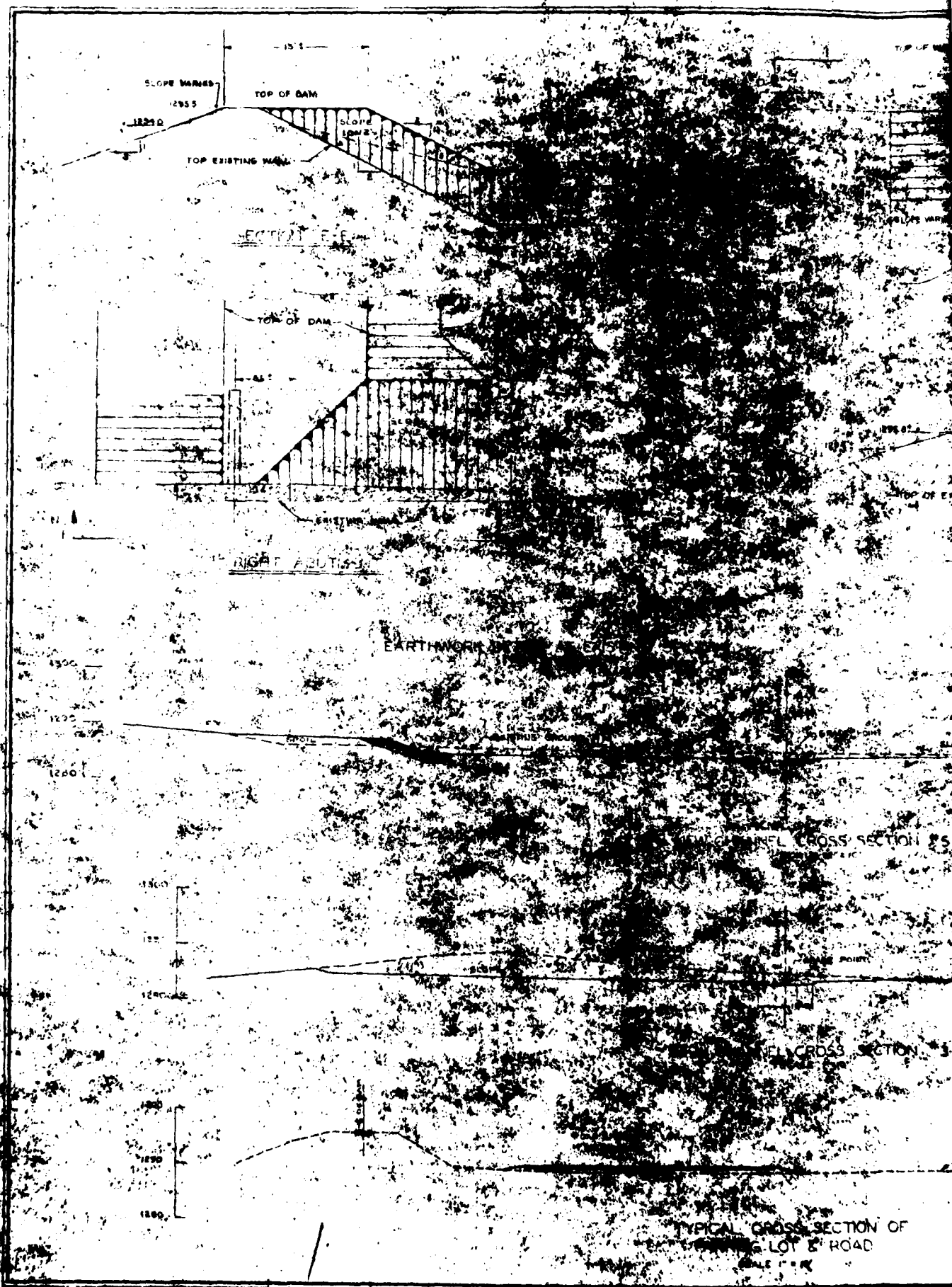
APPROXIMATE EARTHWORK QUANTITIES

1 STRIPPING	450 C.Y.
2 EXCAVATION OF EMBANKMENT	1080 C.Y.
3 CHANNEL EXCAVATION	1430 C.Y.
4 ROLLED EMBANKMENT	1740 C.Y.

- NOTES:
- (1) FOR DETAILS ON CROSS SECTION SEE TYPICAL CROSS SECTION SHEET NO. 4
 - (2) METHOD OF BORING TO EXISTING EMBANKMENT NOT SHOWN SEE TYPICAL CROSS SECTION SHEET NO. 4

PLATE 8

PENNSYLVANIA GAME COMMISSION			
MAKING THE WATER LEVEL AT SHELL MARCH 2001			
THE COUNTY PENNSYLVANIA			
CROSS SECTIONS			
L. ROBERT KIMBALL			
CONSULTING ENGINEER			
DATE: 10/1/01			
DRAWN BY: 10/1/01			
CHECKED BY: 10/1/01			
APPROVED BY: 10/1/01			
DATE	REVISION	BY	APPROVED BY



[illegible]

YOUNG A-A

(NEW HILL)

ORIGINAL GROUND

SECTION B-B

SECTION D-D

A diagram showing a cross-section of a road. A horizontal line is labeled "NEW FILL" with an arrow pointing to it. Below this line, a dashed line represents the "ORIGINAL GROUND" level. The area between the new fill and the original ground is shaded.

SECTION C-C

12' FIP RAP ON G
FILTER BLANKET

SPCL IN NUMBER

SLOPE

RIP RAP DETAILS

NO SCALE

GRAVEL DRAIN MATERIAL
- BLOODED SHAPED STONE
A. 35% TO BE HEAVIER THAN 150 LBS
B. AVE. WT TO BE 80-100 LBS.
C. 10% TO BE NO LIGHTER THAN 35 LBS

PLATE 8

PENNSYLVANIA GAME COMMISSION
RAISING THE WATER LEVEL IN BERKSHIRE
STATE COLLEGE PENNSYLVANIA

EASTWIND OF RAIL

AT BOSTON RAILWAY

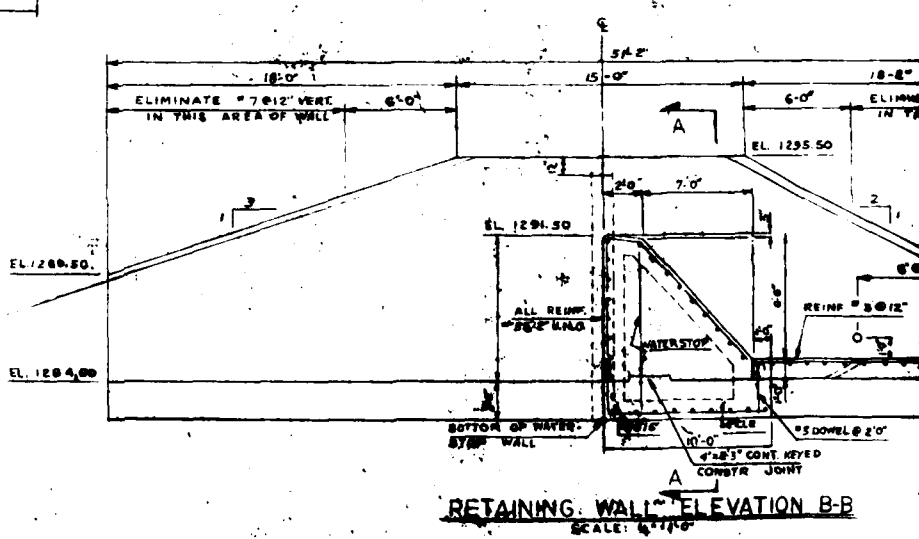
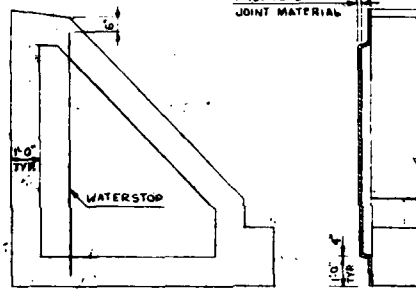
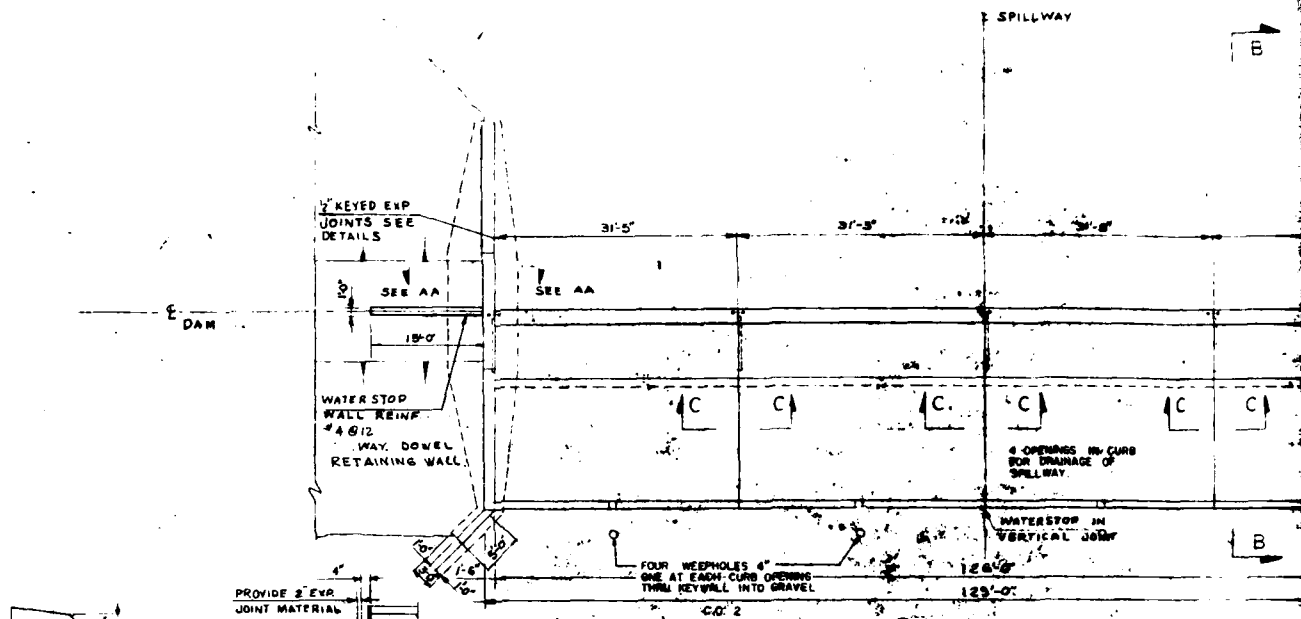
L. ROBERT GIBBALL

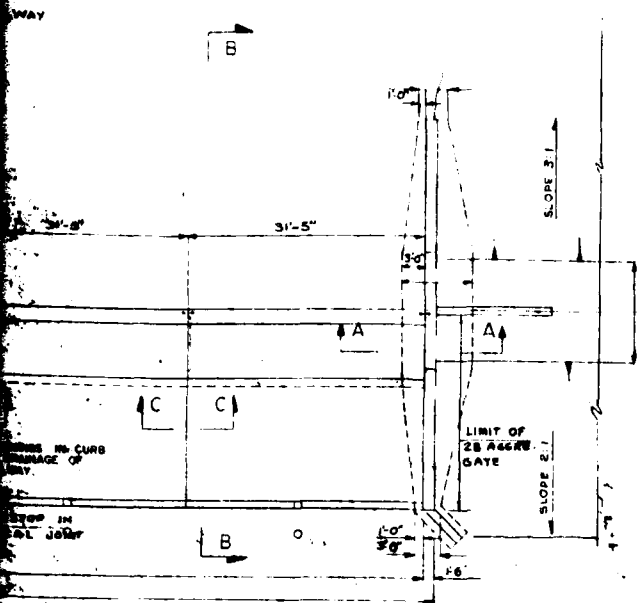
CONFIDENTIAL

ORIGIN OF _____ DATE _____

VERIFIED BY _____ DATE _____

THE UNIVERSITY OF CHICAGO

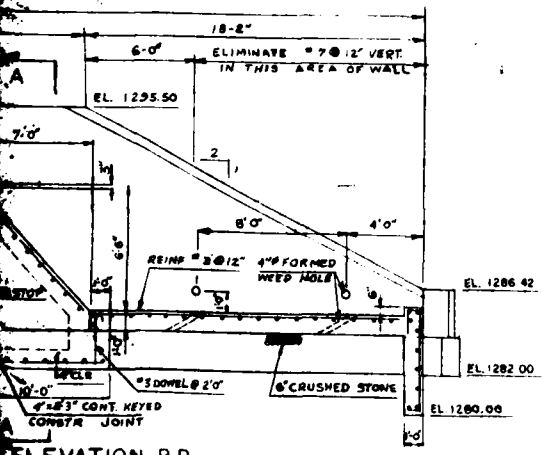




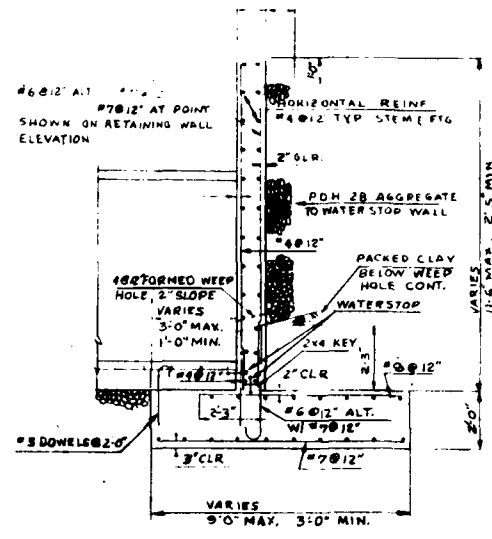
PLAN



SECTION C-C
SCALE: 3/8"=1'-0"



ELEVATION B-B



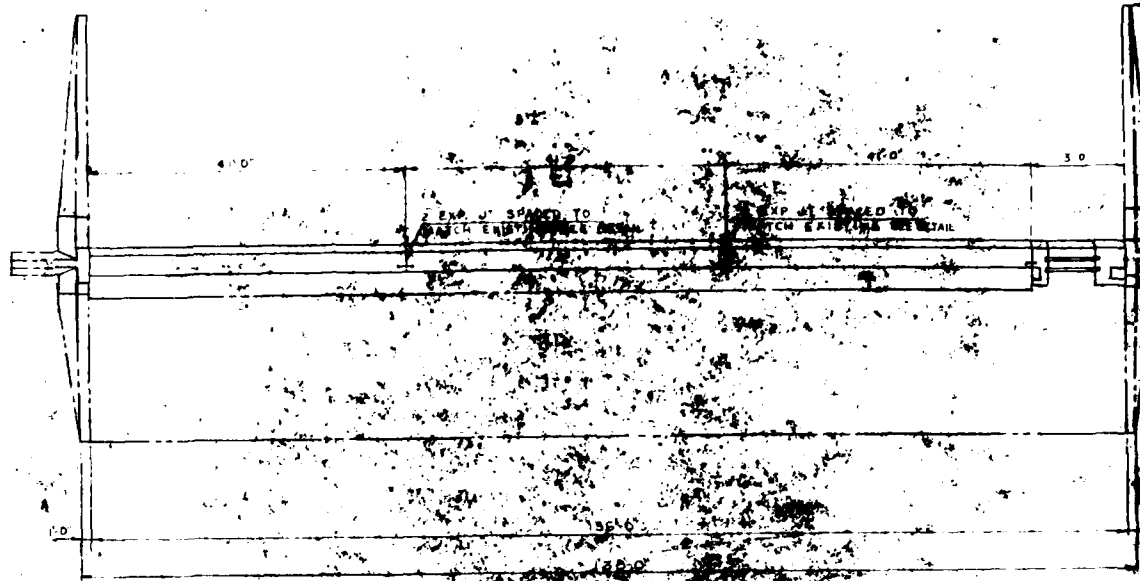
SECTION A-A
SCALE: 3/8"=1'-0"

NOTES:

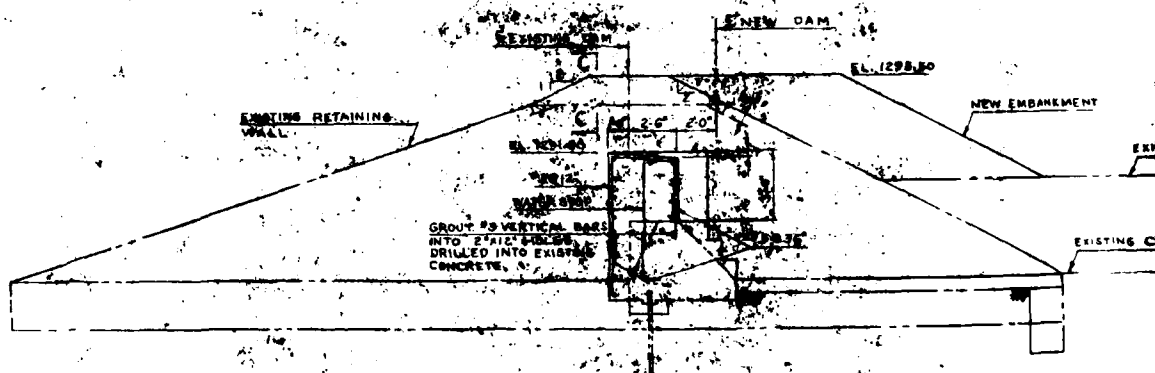
- ALL DIMENSIONS AND EXISTING CONDITIONS SHALL BE CHECKED AND VERIFIED BY CONTRACTOR AT THE SITE.
- ALL CONCRETE SHALL BE CLASS A.
- REINFORCEMENT SHALL HAVE 2" COVER UNLESS NOTED OTHERWISE.
- REINFORCING BAR LAP SHALL BE 30 DIAMETERS.
- DO NOT SCALE DRAWINGS.
- PROVIDE WATERSTOP AT ALL JOINTS.
- REINFORCING BAR BENDS SHALL BE A.C.I. STANDARD.
- U.N.D. DENOTES UNLESS NOTED OTHERWISE

PLATE 7

PENNSYLVANIA GAME COMMISSION			
RAISING THE WATER LEVEL AT SIEGEL MARSH DAM			
ERIE COUNTY PENNSYLVANIA			
NEW SPILLWAY & SECTIONS			
L. ROBERT KIMBALL			
CONSULTING ENGINEERS			
EDINBURGH		PITTSBURGH	
DRAWN BY: J.A. ✓	DATE: MAY 1963	ORDER NO.	SHEET NO.
TRACED BY:	DATE:	68-11-68-01	8
CHECKED BY:	DATE: MAY 1963	SCALE	AS SHOWN
APPROVED BY:	DATE: MAY 1963		
DATE	REVISED	BY	

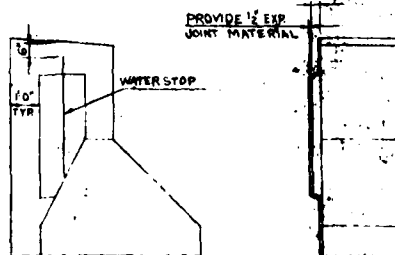


EXISTING SPILLWAY PLAN



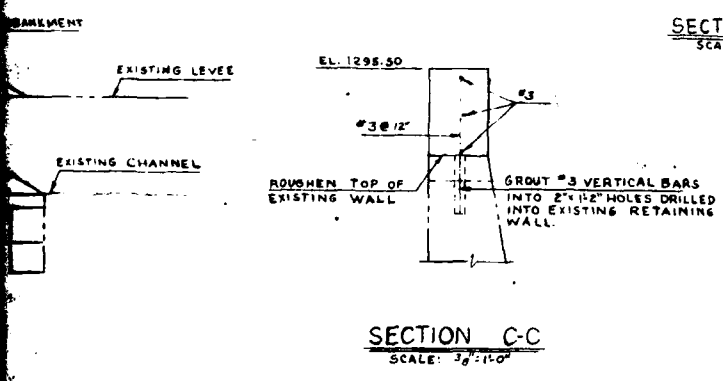
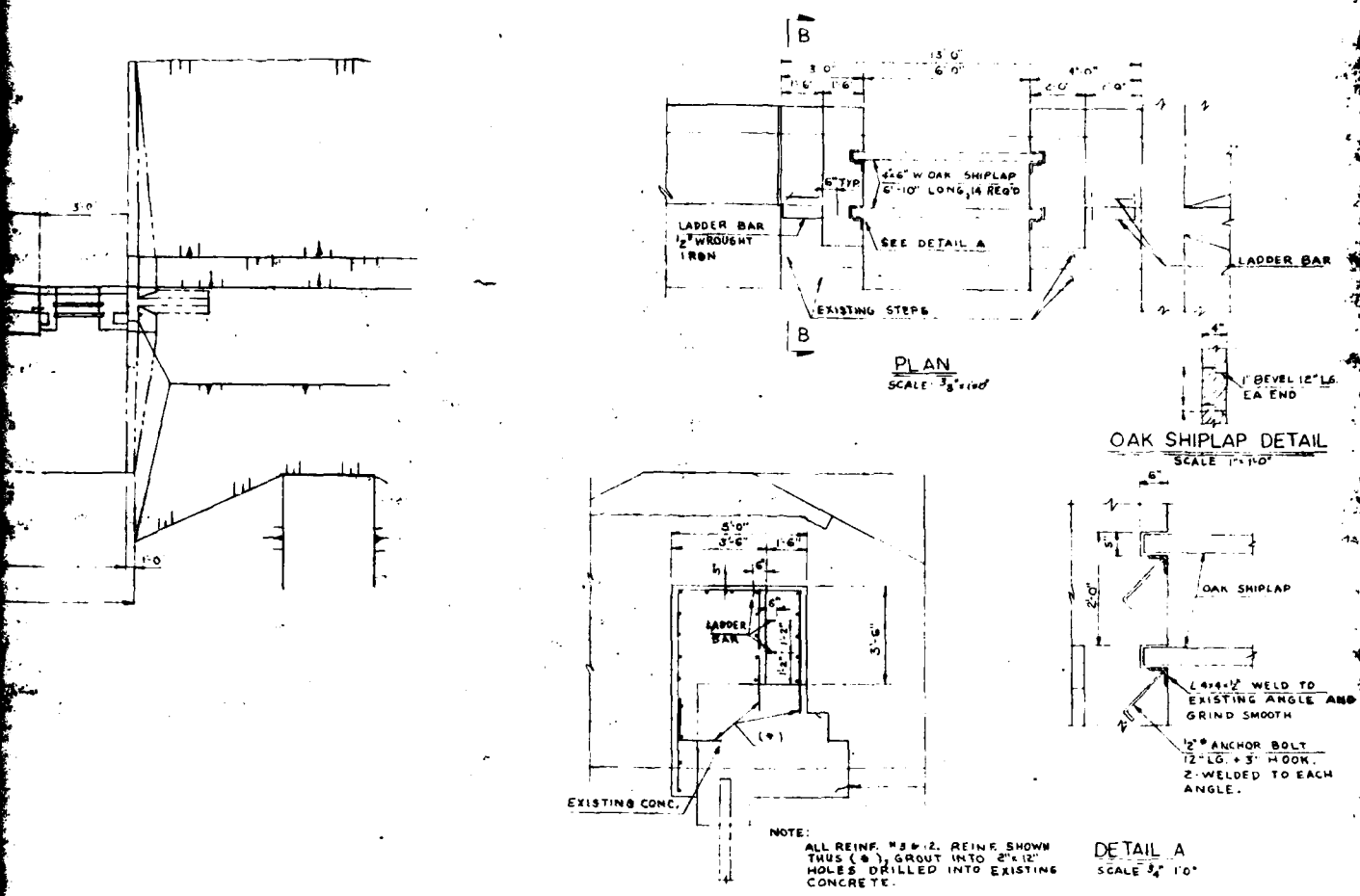
EXISTING SPILLWAY SECTION

SCALE: 1"=10'



KEYED EXP. JOINT DETAILS

SCALE: 1"=10'



GATE DETAILS
SCALE: AS NOTED

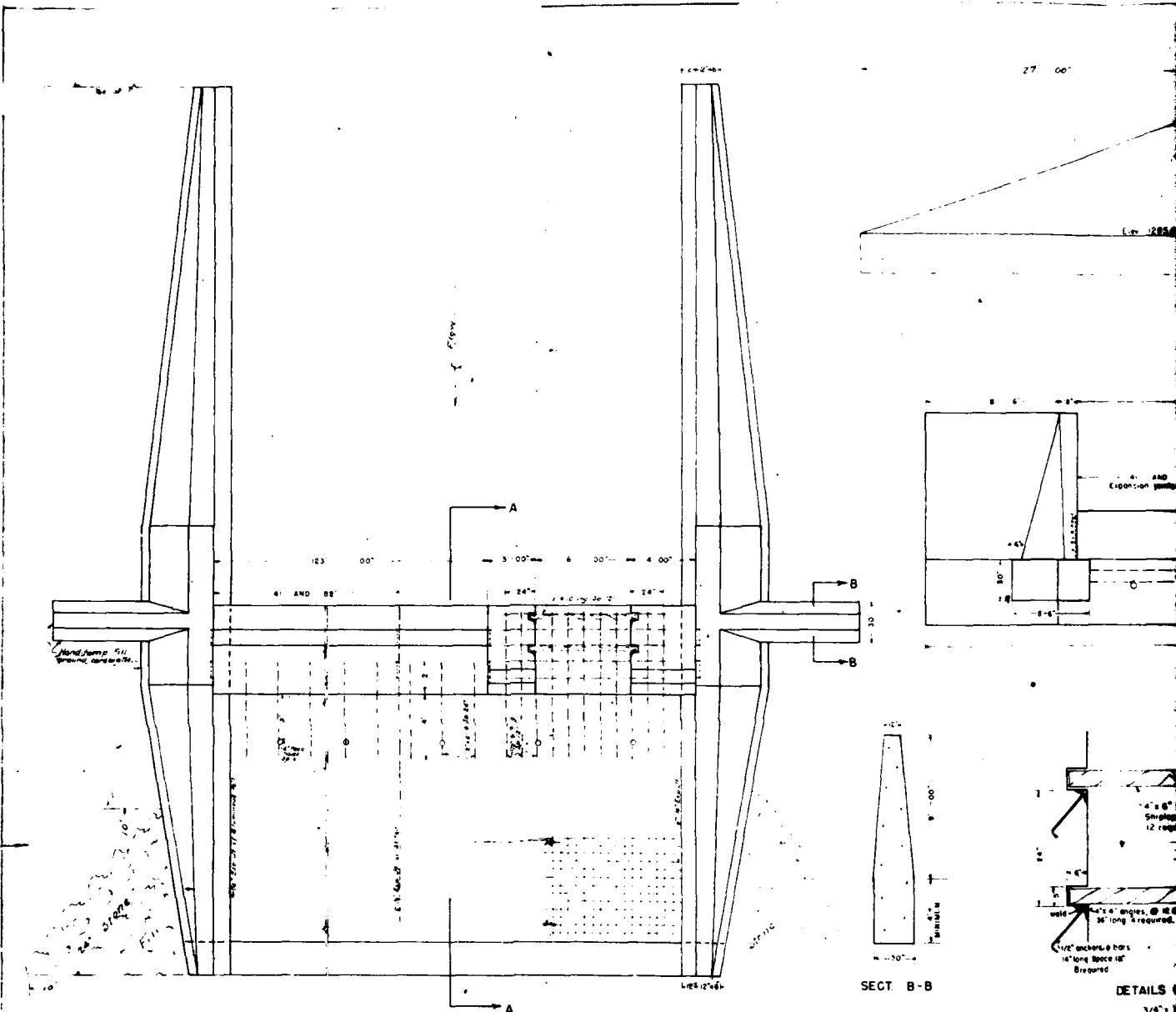
SECTION B-B
SCALE: 3/8" = 1'-0"

SECTION C-C
SCALE: 3/8" = 1'-0"

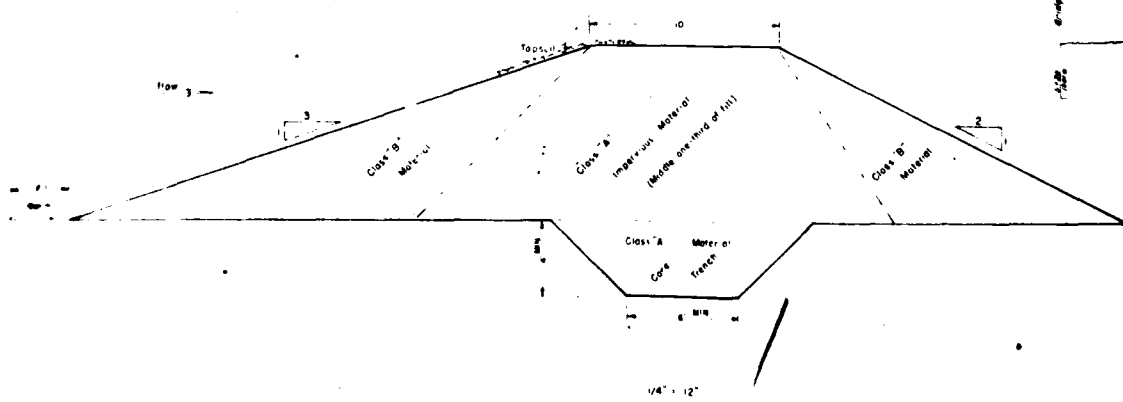
2

PLATE 8

PENNSYLVANIA GAME COMMISSION RAISING THE WATER LEVEL AT SIEGEL MARSH DAM ERIE COUNTY, PENNSYLVANIA			
ADDITION TO EXISTING SPILLWAY			
L. ROBERT KIMBALL CONSULTING ENGINEERS EBENSBURG PENNSYLVANIA PITTSBURGH			
DRAWN BY	DATE MAY 1952	CODE NO.	SHEET NO.
TRACED BY	DATE	68-10-01-00	1
CHECKED BY	DATE MAY 1952	SCALE	AS SHOWN
APPROVED BY	DATE MAY 1952		



PLAN OF SPILLWAY
1/4" = 1'



Note: All dimensions
shall be as
shown by the
plan.

PLATE 9

THIS DRAWING IS NOT THE CURRENT CONDITION OF THE DAM. THE DAM WAS MODIFIED ACCORDING TO PLATES 3-8. THIS PLATE IS PRESENTED HERE TO CLARIFY THE ZONES OF THE EMBANKMENT.

SECTION A-A

DOWNSTREAM ELEVATION

DETAILS OF GATE

PROFILE OF DAM

PROFILE OF STREAM

REVISED	APPROVALS		PROJECT	
	APPROVED BY		PLANS & DETAILS	
	DIRECTOR OF ENGINEERING & CONSTRUCTION		SEIGEL MARSH DAM	
	APPROVED BY		GREENE TOWNSHIP	
	SUPERVISOR ARCHITECT-BUREAU OF CONST.		ERIE COUNTY	
	EXECUTIVE SECRETARY PENNA. GAME COMM.		DATE	
ACCEPTED BY	CONTRACTOR	COMMONWEALTH OF PENNSYLVANIA		
BY		GEORGE H. LEADER, GOVERNOR		
BUREAU OF ENGINEERING & CONSTRUCTION	CHECKED BY	DEPT. OF PROPERTY & SUPPLIES		
ARCH. STRUCT. MECH. ELEC.		SCALE		
		JOHN S. HOGG, SECRETARY		
		AS SHOWN HARRISBURG, PENNA.		
		SHEET NO. 1		

All dimensions and measurements shall be checked and verified by the Contractor at the Site

PLATE 9 OF 10

APPENDIX F

REGIONAL GEOLOGY

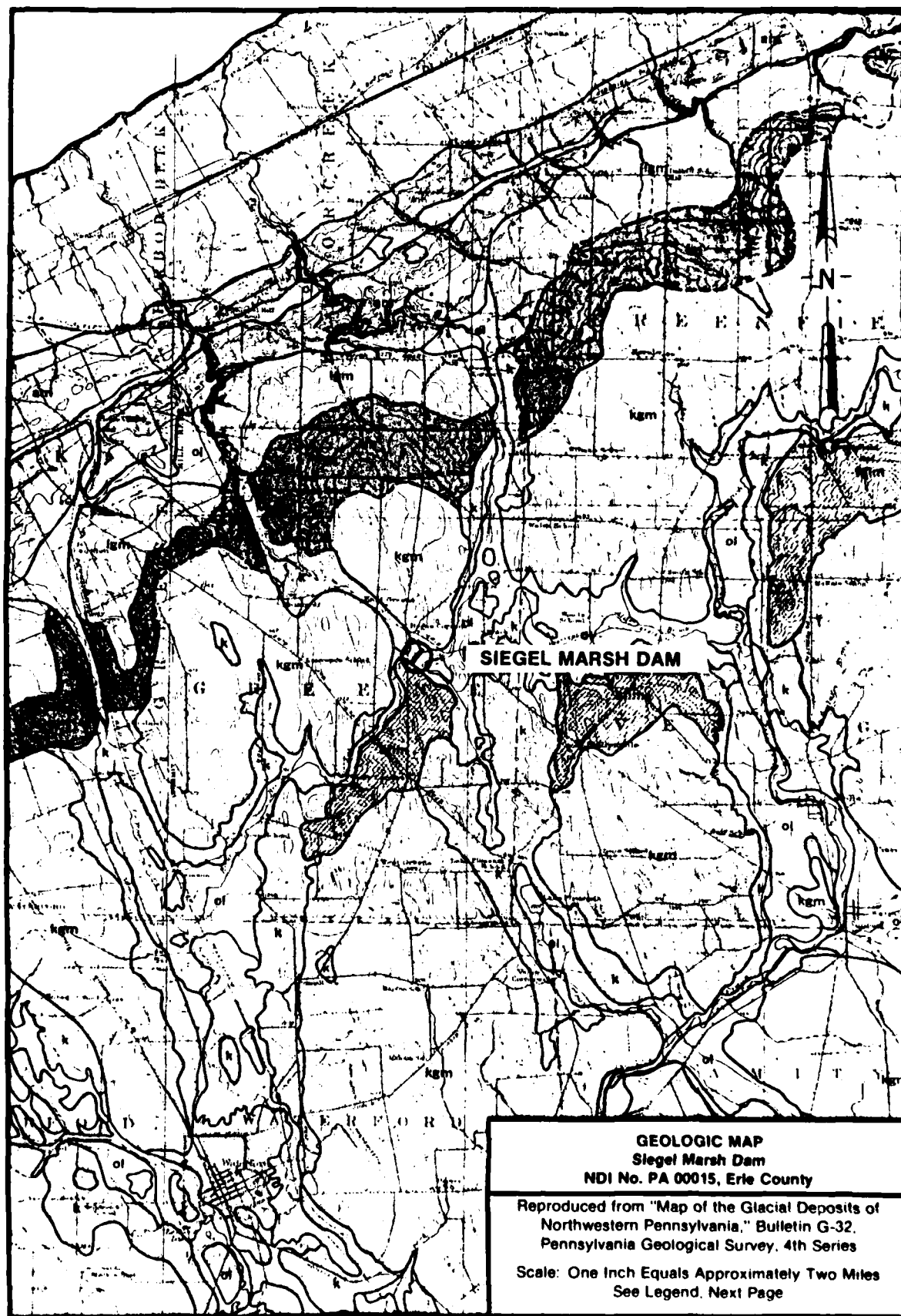
SIEGEL MARSH DAM
NDI No. PA 00015, PennDER No. 25-41


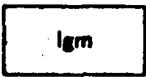





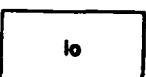

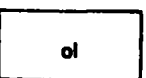
REGIONAL GEOLOGY

Siegel Marsh Dam is located in the glaciated section of the Appalachian Plateaus physiographic province, approximately 9 miles southeast of Lake Erie. The normal pool of the reservoir is approximately 720 feet above the mean lake level of Lake Erie.

According to the "Geologic Map of Pennsylvania" (1960), the bedrock units in the vicinity of the dam are members of the Conneaut group, Devonian system. These units are alternating gray, brown, greenish, and purplish shales and siltstones; including the "Chemung" and "Girard" formations of northwestern Pennsylvania. Bedrock below the dam should be part of the "Chemung" formation; however, this cannot be confirmed because rock was not cored during the foundation exploration for raising of the dam (circa 1969).

The geologic map on the following page indicates that the soil overburden in the vicinity of the dam is complex because of various glacial advances over the area. The soils and foundation report for the dam indicated that the upper 4 to 6 feet is alluvial or colluvial deposits (silts and clays). Below that level the soils are coarser textured containing a higher percentage of sand than the upper level soils. Till deposits were encountered in the auger borings at approximately 20 foot depths. The till deposits were composed of coarse, sandy material with rounded rock fragments scattered throughout. (Reference: Soils and Foundation Report, Siegel Marsh Dam, State Game Land No. 218 by L. Robert Kimball and Associates, circa 1969).



PLEISTOCENE			LEGEND	
PLEISTOCENE	WISCONSIN	CARY	Lavery Till	 Lavery end moraine Till (silt)
				 ground moraine Till (silt)
				 Kent end moraine Till (sandy loam)
			Kent Till	 Findley Lake recessional moraine Till (loam)
				 Clymer recessional moraine Till (loam)
				 ground moraine Till (loam becoming sand, loam toward the east and south- east)
	ILLINOIAN		Inner phase	 ground (?) moraine
			Outer phase	 ground moraine (?)
	ILLINOIAN OR WISCONSIN		Undifferentiated members of units above	 kames, kame terraces, kame moraines, and eskers
			Undifferentiated members of units above	 outwash (valley trains), river terraces, lake deposits including beaches of former high levels of Lake Erie